Original Research Article

Tobacco use and outcomes of pregnancy: A community-based cross-sectional study among the women in the reproductive age group in the rural area of Belgaum District, Karnataka, South India

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ARTICLE INFO

ABSTRACT

Context: Exposure to tobacco smoke affects all stages of human reproduction. Smoking is not rare among Indian women, but research over the past decade has shown that Indian women's use of smokeless tobacco products is substantial and increasing, with negative consequences for both oral morbidity and perinatal health, including premature delivery, low birth weight, and birth length.

Objectives: This study was done to know the prevalence of tobacco consumption among rural women in the reproductive age group and its association with the outcomes of pregnancy

Materials and Methods: A community-based cross-sectional study, was conducted from January 2011 to December 2011 among 1200 rural women aged between 15 years to 49 years residing in Primary Health Centre (PHC) Vantmuri area, Belgaum, Karnataka, India. Statistical analysis was done using rates, ratios, and chi-square tests.

Results: The prevalence of tobacco consumption was 9.7%. In this study, we found that except for the first pregnancy outcomes, and all the subsequent outcomes of the pregnancies, the differences are statistically significant indicating an association between tobacco consumption and the outcome of pregnancy. Also, a significant association was found between tobacco consumption and low birth weight.

Conclusion: Women under the reproductive age group constitute an important cohort of the population. A significant association was found between tobacco consumption and the outcomes of pregnancy. It has become the need of the hour to provide enough evidence on the correlates of tobacco use in the community and to put increasing effort against the expansion of tobacco companies in developing countries, which are often aimed at women.

1. Introduction

Tobacco, being the world's leading cause of preventable death, kills nearly 8 million persons annually. The tobacco toll reaches approximately 1.6 million lives in the WHO South-East Asia Region (SEAR) alone, being among the largest producers and consumers of tobacco products. India is the third largest tobacco-producing nation and the second largest consumer of tobacco worldwide, much of it in smokeless form (SLT) and available in a variety of different types and brands across the country. From GATS 1 in 2009-10 to GATS 2 in 2016-17 the prevalence of any form of tobacco use has dropped significantly by six percentage points from 34.6 percent to 28.6 percent. The relative drop in the prevalence of tobacco use is 17.3 percent. [1]

Smoking is not rare among Indian women, but research over the past decade has shown that Indian women's use of smokeless tobacco products it is significant and increasing,

with negative consequences both on oral morbidity and on perinatal health, in particular prematurity, low birth weight, and birth length. Research has shown time and again that these consequences are dose-responsive, increasing with the quantum of SLT used. Though these epidemiologic links are consistent, there is little research that explores the factors driving SLT use during the reproductive years, especially during pregnancy. Apart from being used, to ameliorate oral health and relief from bowel/abdominal problems, as women claim, it's no surprise that smokeless tobacco performs certain valuable functions including companionship through shared use and stress. Smokeless and smoking forms use, act as a way to manage the emotional state associated with high levels of poverty, low levels of education, heavy workload, marital conflict, and domestic violence. Women also report that chewing tobacco increases the energy available for daily workload and heavy work, especially in the face of limited food intake, and suppresses hunger.[2] The association between maternal tobacco use and risk of perinatal complications has primarily only been focused on maternal smoking, which is an exposure that is a known risk factor for perinatal complications like preterm birth, low birth weight, and small for gestational age, and perinatal death, some of the causal associations include fetal hypoxia, intrauterine growth restriction, and placental abruption. To date, more than 7000 chemicals in inhaled tobacco smoke have been identified by numerous investigations that cross the placenta and can potentially harm the fetus. A recent statistical summary of the data from 173 687 cases and 11.7 million controls identified the potent effect of maternal smoking on an ever-widening range of birth defects.[3]

Countries are increasingly relying on MPOWER measures to reduce the significant harms and costs caused by tobacco to their populations.[4] These measures are part of MPOWER - a package of six proven policies to:

1. Monitor tobacco use and prevention policies;
2. Protect people from tobacco smoke;
3. Offer help to quit tobacco use;
4. Warn about the dangers of tobacco;
5. Enforce bans on tobacco advertising, promotion and sponsorship; and
6. Raise taxes on tobacco.

The Government of India has taken note of the tobacco epidemic and has responded by initiating several measures to contain the same. The Government's regulatory action toward tobacco control began in 2003 with the enactment of the Cigarettes and Other Tobacco Products (Prohibition of Advertising and Regulation of Trade, Production, Supply, and Distribution) Act, 2003 (COTPA). India has been one of the earliest countries to ratify the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) in 2004. India launched its National Tobacco Control Program In 2007-08. Legally, smoking is completely banned in most public places and workplaces, and advertising, promotion, and sponsorship of all forms of tobacco are prohibited. It is mandatory to have pictorial and text health warning labels on tobacco product packages. Recognizing that SLT use among women is an increasing problem that needs to be addressed through social/behavioral and policy-level approaches, both Indian and international researchers have called for more research that goes beyond the epidemiology of SLT use and its health consequences to explore patterns of women's use, especially during pregnancy and reproductive years and factors contributing to the simultaneous use of multiple forms of smokeless tobacco (poly smokeless tobacco use) during this period.[2]

2. Materials and Methods

2.1. Study design

This was a community-based cross-sectional study

2.2. Study period

The study was conducted from January 2011 to December 2011

2.3. Study area

The study was undertaken in the area under the Primary Health Centre, Vantmuri, a rural field practice area of the Department of Community Medicine, Jawaharlal Nehru Medical College, Belgaum.

2.4. Sample size

1200 rural women aged between 15 years to 49 years residing in PHC Vantmuri area, Belgaum, Karnataka, India using a structured prevalidated questionnaire.

2.5. Sampling strategy

The total population of Vantmuri PHC was 34190. There were 17 villages under the Vantmuri PHC under 5 subcentres. Considering the population of women under the reproductive age group as 22%, accordingly, the total population of women under the reproductive age group is 7522. The sample of 1200 was taken proportionately from all the villages depending upon the population of each village using a systematic random sampling method.

2.6. Inclusion criteria

So, all women in the age group of 15-49 years and girls less than 15 years who have attained menarche were in the inclusion criteria.

2.7. Study instrument

A detailed questionnaire was prepared and pretested and validated during the pilot study. It included information on socio-demographic variables, type of family, educational status, menstrual and obstetric history, and one-month prior morbidity.

2.8. Data collection

According to NFHS 3,[5] 15-49 years aged women were considered as women under the reproductive age group. Every tenth household was visited and data regarding women under the reproductive age group were collected. In households with more than one eligible study subject, the chit method was used for selecting the study participant. Subjects were interviewed by the candidate in-person and detailed information regarding tobacco consumption was obtained. The entire procedure lasted for about 45 minutes.

Morbid conditions requiring further investigation and special care were referred to the KLES Dr. Prabhakar Kore Charitable Hospital and District Hospital, Belgaum.

2.9. Ethical considerations

The study was approved by Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belgaum. Based on the selection criteria the study subjects were selected and written informed consent was obtained from all the participants. They were interviewed using a predesigned and pretested questionnaire.

2.10. Data analysis

The data were tabulated using Microsoft Excel Worksheet and analyzed using mean, proportions, and percentages. The statistical analysis was done with SPSS 18 statistical software.

2.11. Terminologies

(Tobacco consumption and Tobacco use are used synonymously in our study).

2.11.1. Age group
According to NFHS 3, 15-49 years aged women were considered as women under the reproductive age group. Subjects were asked about their age and it was confirmed with appropriate documents (Ration card). Age was recorded to the nearest completed year. For those who did not have a ration card, their age was confirmed by menstrual history.

2.11.2. Obstetric terms[6,7]
Spontaneous abortion: Expulsion from the mother of an embryo or fetus weighing 500 gm or less/ less than 22 weeks of gestation when it is not capable of independent survival.

Preterm delivery: Labor before the 37th completed week (<259 days) counting from the 1st day of the last menstrual period.

Stillbirth: Birth of the newborn after 28 completed weeks (>1000gms), when the baby does not breathe or show any signs of life after delivery.

Low Birth weight: Birth weight less than 2500 gms irrespective of the gestational age.

3. Results

Out of the 1200 study participants, 117 had ever consumed tobacco. The prevalence of tobacco consumption was 9.7%.

As mentioned in Table 1, out of a total of 910 outcomes of the first pregnancies (excluding those currently pregnant and irrespective of subsequent pregnancies/deliveries) 820 were among non-users as compared to 90 among tobacco users. To find the association, abortions, preterm deliveries, and stillbirths were grouped together as an abnormal outcome and calculated against the normal outcome. Among the non-users, 10(1.2%), and 35(5.2%) had spontaneous abortions and preterm deliveries respectively as compared to 1(1.1%), 6(6.7%) of the tobacco users who had abortions and preterm deliveries respectively. Though the percentages of abnormal outcomes were high among tobacco users, the difference was not statistically significant. ($\chi2= 0.79$, p=0.374)

Out of 670 outcomes of second pregnancies, 18(3.0%) spontaneous abortions and 18(3.0%) preterm deliveries were recorded among the 589 nonusers whereas 6(7.4%) spontaneous abortions, 8(9.9%) preterm deliveries and 1(1.2%) stillbirth were observed in tobacco users and the difference observed was statistically significant. ($\chi2=15.59$, p=0.00008).

Similarly, out of 330 study participants with three pregnancies, 8(2.9%) and 19(6.9%), nonusers had spontaneous abortions and preterm deliveries respectively. Out of 55 third pregnancies among tobacco users, 7(12.7%), 2(3.6%), and 3(5.5%) were spontaneous abortions, preterm deliveries, and stillbirths respectively. This difference was statistically significant. ($\chi2=6.33$, p=0.012). Out of a total of 94 fourth pregnancy outcomes, 1 (one) was preterm delivery among nonusers as compared to one (1) preterm and 4 (16.7%) stillbirths respectively among the tobacco users recorded and this difference was statistically significant. ($\chi2_{yc}=8.25$, p=0.004, Fisher exact- 0.004).

In this study, as shown in Table 2, out of 899 babies of the first birth order, 810 were born to women who were nonusers and 89 were born to tobacco users. 90(11.1%) babies born to nonusers were of low birth weight whereas 54(60.7%) babies born to tobacco users were of low birth weight. This difference was strongly statistically significant. ($\chi2= 146.434$, p< 0.0001).

Table 1: Association of tobacco consumption with outcomes of pregnancy

Pregnancies (Gravida)	Outcomes	Study participants		Total	
		Nonusers	Users		
First	Normal	775(94.5%)	83(92.2%)	858(94.3%)	$\chi2= 0.79$ p=0.374
	Abortions	10(1.2%)	1(1.1%)	11(1.2%)	
	Preterm	35(5.2%)	6(6.7%)	41(4.5%)	
Total		**820(100%)**	**90(100%)**	**910(100%)**	
Second	Normal	553(93.9%)	66(81.5%)	619(92.4%)	$\chi2=15.59$ p=0.00008
	Abortions	18(3.0%)	6(7.4%)	24(3.6%)	
	Preterm	18(3.0%)	8(9.9%)	26(3.9%)	
	Stillbirths	0(0%)	1(1.2%)	1(0.1%)	
Total		**589(100%)**	**81(100%)**	**670(100%)**	
Third	Normal	248(90.2%)	43(78.1%)	291(87.9%)	$\chi2=6.33$ p=0.012
	Abortions	8(2.9%)	7(12.7%)	15(4.5%)	
	Preterm	19(6.9%)	2(3.6%)	21(6.5%)	
	Stillbirths	0(0%)	3(5.5%)	3(0.9%)	
Total		**275((100%)**	**55((100%)**	**330**(100%)	
Fourth	Normal	69(98.6%)	19(79.1%)	88(93.6%)	$\chi2_{yc} =8.25$ p=0.004 Fisher exact- 0.004
	Preterm	1(1.4%)	1(4.2%)	2(2.1%)	
	Stillbirths	0(0%)	4(16.7%)	4(4.3%)	
Total		**70(100%)**	**24(100%)**	**94(100%)**	

Table 2: Association of Birth weight with consumption of tobacco

Birth order of newborn	Birth weight	Study participants		Total	
		Nonusers	Users		
First	Normal	720(88.9%)	35(39.3%)	755(84.0%)	$\chi2= 146.434$ p< 0.0001
	Low	90(11.1%)	54(60.7%)	144(16.0%)	
Total		**810(100%)**	**89(100%)**	**899(100%)**	
Second	Normal	460(80.6%)	21(28.4%)	481(74.6%)	$\chi2=94.076$ p<0.0001
	Low	111(19.4%)	53(71.6%)	164(25.4%)	
Total		**571(100%)**	**74(100%)**	**645(100%)**	
Third	Normal	213(79.8%)	11(24.4%)	224(71.8%)	$\chi2=58.221$ p< 0.0001
	Low	54(20.2%)	34(75.6%)	88(28.2%)	
Total		**267(100%)**	**45(100%)**	**312(100%)**	
Fourth	Normal	60(85.7%)	3(15.0%)	63(70.0%)	$\chi2=37.041$ p<0.0001
	Low	10(14.3%)	17(85.0%)	27(30.0%)	
Total		**70(100%)**	**20(100%)**	**90(100%)**	

Similarly, amongst the babies born of second birth order, 111(19.4%) babies born were of low birth weight among the nonusers whereas 53(71.6%) were of low birth weight among the users. ($\chi2=94.076$, p<0.0001).

Among the babies born of third birth order, 54(20.2%) babies born were of low birth weight among the nonusers, whereas 34(75.6%) babies were of low birth weight amongst the tobacco users. ($\chi2=58.221$, p< 0.0001)

Among the babies born of fourth birth order, 10(14.3%) babies born to nonusers and 17(85.0%) born to tobacco users were of low birth weight and the difference observed was statistically significant ($\chi2=37.041$, p<0.0001)

4. Discussion

Gestation is theorized as a 'teachable moment' for women when their perception of health risk is heightened.[8]

Effects of Tobacco consumption before and during pregnancy:[9–11]

Along with the risk of suffering from various health hazards from tobacco use, women are more prone to reproductive health hazards. Women who consume tobacco experience unique health effects especially related to menstrual and reproductive function. They have:

1. An increased risk
2. Of primary and secondary infertility
3. Of delay in conception
4. For ectopic pregnancy and spontaneous abortion
5. For adverse pregnancy outcomes
6. Premature rupture of membranes
7. Abruptio placentae
8. Placenta Previa
9. Preterm delivery

Fig. 1: Tobacco and pregnancy (Image Source: https://www.acog. org/womens-heath/infographics/tobacco-and-pregnancy)

10. Giving birth to low-birth-weight babies and small for gestational age babies which are associated with perinatal, neonatal, and infant morbidity and mortality, the longer the mother smokes during pregnancy, the greater the effect on the infant's birth weight.
11. Giving birth to a stillborn child
12. Death of an infant the in peri-natal period and the risk for Sudden Infant Death Syndrome.
13. Women who smoke are less likely to breastfeed their infants than women who do not.

Pregnancy is a time of preparedness and tobacco cessation, not only for women but also for their partners and other people living in their households.[8]

Women who quit smoking before or during pregnancy have reduced threats for adverse reproductive outcomes, including difficulties in becoming pregnant, infertility, and premature rupture of membranes, preterm delivery, and low-birth weight.[12]

Previous epidemiological studies have also reported that tobacco use is associated with preterm delivery. Smoking during pregnancy releases carbon monoxide and/or nicotine which induce fetal hypoxia. Fetal hemoglobin has an increased affinity for carbon monoxide than adult hemoglobin and the impact on the fetus is more severe than on the mother. Therefore, counseling of pregnant females about the detrimental effects of tobacco use is warranted.[12]

In our study, except for the first pregnancy outcomes, and all the subsequent outcomes of the pregnancies, the differences were statistically significant indicating an association between tobacco consumption and the outcome of pregnancy. Also, a significant association was found between tobacco consumption and low birth weight.

World Health Organization (WHO) in its latest global trends in tobacco use found that over eight million people died from a tobacco-related disease in 2019. The number of deaths due to tobacco use is expected to continue to rise even as the rates of tobacco use drop down, the reason being tobacco products kill their users and people exposed to its emissions slowly over time.

The overall prevalence of tobacco use is decreasing. As in other WHO regions, the age-standardized tobacco use prevalence rate in SEAR is declining even though it still has the highest tobacco use prevalence. WHO, in its global report on trends in the prevalence of tobacco use 2000-2025, third edition (2019), estimates that, in 2000, the Region had an estimated total tobacco use rate of around 47%, whereas, in 2010, about 33% of India's population aged 15 years and older were current tobacco users (approximately 276,431,200 people). By 2018 tobacco use prevalence among adults aged 15 years and older was estimated at nearly 29% (47.3% males and 10.8% females). If tobacco control efforts continue at the same intensity, WHO projects that in 2025 around 22% of the population aged 15 years and older (approximately 243,607,200 people) will be tobacco users.

WHO Member States adopted a voluntary global target to reduce the use of tobacco (smoking and smokeless combined) by 30% by 2025. If India adopts this global target, the results indicate that, based on current trends, India is unlikely to achieve the target.[13,14]

According to the Global Adult Tobacco Survey (GATS) II, the overall prevalence of tobacco has decreased by six percent from 34.6% in GATS I to 28.6%.[1]

According to the NFHS5 report, 9 percent of women aged 15 and over currently use any form of tobacco.[15]

In a study titled "Smokeless tobacco use, birth weight, and gestational age: a population-based, prospective cohort study of 1217 women in Mumbai, India" by Prakash C Gupta et al; Smokeless tobacco use was associated with an average reduction of 105 g in birth weight (95% confidence interval 30 g to 181 g) and a reduction in gestational age of 6.2 (3.0 to 9.4) days. The odds ratio for low birth weight was 1.6 (1.1 to 2.4), adjusted by logistic regression for maternal age, education, socioeconomic status, weight,

anemia, antenatal care, and gestational age. The adjusted odds ratio for preterm delivery (< 37 weeks) was 1.4 (1.0 to 2.1); for delivery before 32 weeks, it was 4.9 (2.1 to 11.8) and before 28 weeks it was 8.0 (2.6 to 27.2). [16]

In a study done by Steyn K. et al, on the patterns and effects of maternal snuff use, cigarette smoking, and exposure to environmental tobacco smoke during pregnancy on birthweight and gestational age, in women living in Johannesburg and Soweto in 1990, the mean birthweight of non-tobacco users was 3148gm [95% CI 3123, 3173] and that of the smokers 2982g [95% CI 2875, 3090], resulting in a significantly lower mean birthweight of 165gms for babies of smoking mothers (P = 0.005). In contrast, women using snuff gave birth to infants with a mean birthweight of 3118g [95% CI 3043, 3192], which is a non-significant (P= 0.52) decrease (29.4g) in their infants' birthweights compared with those not using tobacco. [17]

According to NFHS5, only Eighty-five percent of women aged 15-49 who had a live birth in the five years before the survey received antenatal care from a skilled provider at least once for their last birth. Out of the total Eighty-five percent of pregnant women, only 59% of women had at least four ANC visits during their last pregnancy, as recommended by WHO and six percent of women had no ANC visits. [15]

With such a level of antenatal care coverage, there are many chances that some women might consume inappropriate stuff such as teratogenic medicines, tobacco, alcohol, or other harmful substances during pregnancy. Many pregnant women, especially those who are less educated might not be aware of the harmful effects of tobacco consumption during pregnancy, thus it is the responsibility of the health system to intervene by counseling them against tobacco consumption. Guidelines prescribed by the government of India for antenatal care and Indian Public Health Standards (IPHS) clearly mention that auxiliary nurse midwives (ANM) and physicians should ask about the history of tobacco consumption habits a pregnant woman during antenatal visits and intervene by counseling pregnant women to quit tobacco at least during pregnancy and possibly forever. In the absence of recent population-based estimates about tobacco use during pregnancy, there is a lack of evidence about whether there is a need for tobacco cessation programs specifically for pregnant women, and for those who are planning pregnancy. Moreover, enough idea about the extent of knowledge a pregnant woman has about the harmful effects of tobacco use during pregnancy. And lastly, we do not have much data to support whether the auxiliary nurse midwives (ANMs), ASHA (community health workers), and physicians currently are providing any type of health education to pregnant women against tobacco use during pregnancy. Thus, to fill the existing gap in knowledge, we undertook this study with the objective to assess the prevalence, extent, and determinants of tobacco use during pregnancy. [18]

5. Conclusion

Women under the reproductive age group constitute an important segment of the population. It was evident from this study that tobacco use is widespread among the women under the reproductive age group in the study area. Tobacco awareness and control measures have been slightly gender-based, with little understanding of the context and challenges of women's tobacco use. The findings of the study highlight the need for public health measures to prevent smoked and smokeless tobacco use from emerging as a habit in women and the need for awareness regarding the negative health consequences to the infant from a mother's use of tobacco that often starts during pregnancy.

5.1. What this study adds

The present study helps in

1. Adding up evidence and marking a case for gender and diversity analysis in tobacco control activities.
2. Assessing the effects of tobacco use on the reproductive system of women.

6. Limitations of the Study

1. Most of the information in our study was self-reported, therefore, it was prone to reporting and also recall bias. However, the potential effect of such bias might be an underestimation of the association because such biases tend to distort the associations towards null. The potential effect of tobacco and other risk factors may even be more pronounced on adverse pregnancy outcomes, given that we assume that such misclassification exists in our study
2. As our study is a cross-sectional study, all the associations regarding tobacco consumption need to be established by conducting analytical studies.

7. Recommendations

1. Similar/interventional studies to be carried out even at the lowest level to focus on decreasing tobacco use in specific sub-populations, such as schoolgirls, young pregnant and mothering women
2. Increasing efforts against the expansion of tobacco companies in developing countries, which are often aimed at women.
3. All pregnant women (regardless of their tobacco consumption habit) should be enquired about and advised against tobacco consumption during their antenatal visits because some women might start consuming tobacco after they become pregnant.
4. Any intervention program developed to prevent a woman from consuming tobacco during pregnancy

must involve the husband and also all family members should be sensitized not to expose pregnant women to second-hand smoke.

8. Source of Funding

Nil.

9. Conflict of Interest

Nil.

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