



A REVIEW OF TOBACCO CONSUMPTION DURING PREGNANCY AND ITS IMPACT ON CHILD DEVELOPMENT

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ABSTRACT: Tobacco use is the major public health problem and foremost preventable cause of mortality and morbidity in the world today. While overall prevalence of global tobacco use among men is declining slowly, the use of tobacco among women is increasing rapidly. Globally, 52.9% of women who smoked daily continued to smoke daily during pregnancy. Tobacco prevalence is the highest in North-East India (22.8%) and lowest in South India (0.5%), higher for rural women (5.4%) than for urban women (2.8%), and decreases with increasing education level. The prevalence is highest for women with no education (9.7%) and lowest for those with high education level (0.4%). The prevalence is higher for Christian (12.3%) and Muslim (5.7%) women than for Hindu women (4.3%). Similarly, the prevalence of tobacco use is higher for women of scheduled tribe (13.2%) than for women of all other castes. Smoking can prevent women from getting pregnant in the first place. Even in the first trimester smoking affects the health of the unborn baby. According to the CDC, smoking raises the likelihood of both early miscarriage and stillbirth. Smoking during pregnancy may be responsible for 15% of all preterm births and a 15% increase in overall perinatal mortality. The relation between smoking and ectopic pregnancy might be causal, with a highly significant adjusted odds ratio of 2.5 or more for women who smoke more than 20 cigarettes a day. Smoking during pregnancy can cause low birth weight and it has also an evidence of effect in cognitive development of the child. Early child development has major impacts on future human capital and health. In sum, the scientific evidence suggests that smoking during pregnancy is associated with a number of adverse effects on the growth, cognitive development and behaviour of exposed offspring.

KEY WORDS: Tobacco, Pregnancy, Childhood, Miscarriage, Stillbirth, Ectopic Pregnancy, Placenta Abruption, Placenta Previa, Preterm birth, Low birth Weight.

INTRODUCTION:

Tobacco is a leading global disease risk factor. Although more than 80% of the world's smokers live in low-income and middle-income countries (LMICs), population-based data for prevalence of tobacco use in pregnant women in these countries is insufficient.¹

Globally, tobacco consumption is responsible for 8 million deaths annually; one million of these occur in India. India remains the second-largest tobacco consuming country despite a long history of tobacco control. Apparently, the precept of tobacco control in India mainly focuses on men.

Tobacco use is the major public health problem and foremost preventable cause of mortality and morbidity in the world today. Tobacco related deaths among women aged 20 years and above may rise from 1.5 million in 2004 to 2.5 million by 2030 and almost 75% of these projected death will be occurring in low and middle-income countries. While overall prevalence of global tobacco use among men is declining slowly, the use of tobacco among women is increasing rapidly. The women from developing countries are at a higher risk.

Using tobacco during pregnancy does not only affect mother, but also the fetus health. Deep vein thrombosis, pulmonary embolism, myocardial infarction, ectopic pregnancy, placenta previa in mother and preterm birth, still birth, stunted gestational development, congenital heart disease in child are associated with tobacco use during pregnancy. Despite having knowledge on adverse health effects of tobacco use during pregnancy, it was found that the habit of tobacco consumption does not significantly change before and after getting pregnant.²

Nearly 9.4% of women reported smoking before pregnancy and 7.1% during pregnancy, both at high and low intensity, and smoking rates were higher in the first trimester (7.1%) than in the second (6.1%) or the third (5.7%) trimester. Non-Hispanic White women, women 20–24 years old, and women with less than a high school education were the strongest predictors of smoking anytime during pregnancy.³

A study by Lange S. et al. showed that, globally, 72.5% (95% CI 70.4–75.0) of women who smoked during pregnancy were daily smokers, and 27.5% (25.4–29.6) were occasional smokers. In terms of quantity, more than half of all women who smoked during pregnancy (51.8%, 95% CI 50.0–53.5) were light smokers, 34.8% (33.1–36.4) were moderate smokers, and 13.5% (12.3–14.7) were heavy smokers. The proportion of women who smoked daily and continued to smoke daily during pregnancy ranged from 30.6% (95% CI 25.6–36.4) in the European Region to 79.6% (44.2–100.0) in the Western Pacific Region (figure 4). Globally, this proportion was estimated to be 52.9% (95% CI 45.6–60.3).⁴

Seven decades after independence, India has not been able to provide ‘full’ antenatal care to every pregnant woman. Overall only, 21.0% (urban = 31.1%, rural = 16.7%) women in India received ‘full’ antenatal care. In the state of Madhya Pradesh, only half (53.1%) of all pregnant women visited health centres during the first trimester, only one-third (35.7%) had four antenatal visits and merely 11.4% received ‘full’ antenatal care. Tobacco use during pregnancy can contribute to maternal and perinatal/infant mortality. As per the National Family Health Survey (NFHS)-4, the prevalence of tobacco consumption among Indian women was 6.8% (urban = 4.4%, rural = 8.1%). As per NFHS-3, about 9.5% of all pregnant women (smokeless tobacco = 8.5%, smoking = 1.0%) in India consumed tobacco in one form or another.⁵

PREVALENCE AND PATTERNS OF TOBACCO USE:

Tobacco use during pregnancy was reported in all WHO regions, and some countries had much higher maternal smoking rates, such as Nepal (5.9%), Jordan (9.6%), and Turkey (15.0%). In 21 countries, maternal smokeless tobacco use was higher than tobacco smoking, emphasizing the importance of assessing all forms of tobacco use.⁶

Globally, 52.9% of women who smoked daily continued to smoke daily during pregnancy. The European Region had the highest estimated prevalence of smoking during pregnancy (8.1%) but the lowest estimated proportion of women who smoked daily and continued to smoke daily during pregnancy (30.6%). The African Region had the lowest estimated prevalence of smoking during pregnancy (0.8%) but the second highest estimated proportion of women who smoked daily and continued to smoke daily during pregnancy (61.9%). The Western Pacific Region had the highest proportion of women who smoked daily and continued to smoke daily during pregnancy (79.6%).⁴

The WHO report in 2018 showed that the prevalence of cigarette smoking among women in the continents of Africa, America, Eastern Mediterranean, Europe, Southeast Asia, and Western Pacific was 1.4%, 10.2%, 1.5%, 17.5%, 0.9, and 2.5%, respectively. The lowest prevalence is in the West Pacific and the Africa continent, while Europe has the highest prevalence. Based on the World Bank report, the prevalence of smoking among women in countries with high-income, upper middle-income, lower middle-income, and low-income was equal to 16.1%, 4.4%, 1.3%, and 2%, respectively, which indicating a high prevalence of consumption in high-income countries.⁷

India has 29 states and 7 union territories with wide cultural differences and habits; tobacco use is ingrained as a cultural practice and resultant addiction. In India, tobacco is used as smoked and smokeless forms. In India, about 28.6% of the population consume tobacco. Nationally representative surveys and community-based studies have shown that tobacco consumption among the poor has continued. The cyclical relationship between tobacco use among the poor and exacerbation of poverty due to tobacco-related diseases is also well-documented. Health care costs involve not only direct medical costs but also indirect morbidity and mortality costs. India is a low and middle-income country (LMIC). Government expenditure on health has continuously declined and public spending on health is 1.15% of gross domestic product. Health expenditure is mostly out of pocket in India and it also consequently exacerbates the poverty rates due to high out-of-pocket expenditure for treatment of tobacco-related diseases. In India, socio-economic and health inequalities are rampant. Tobacco-related diseases are a cause and consequence of poverty. It is not only merely a social and cultural problem but it is also multifaceted and encompasses biomedical, economic, and geopolitical. Tobacco use in India is projected to have devastating consequences.⁸

Pasupuleti S. R. S. et al. in their recent study stated that the prevalence of tobacco use is found to increase with the age group from 3.1% in the age group 15–19 years to 21.4% in the age group 45–49 years. Tobacco prevalence is the highest in North-East India (22.8%) and lowest in South India (0.5%), higher for rural women (5.4%) than for urban women (2.8%), and decreases with increasing education level. The prevalence is highest for women with no education (9.7%) and lowest for those with high education level (0.4%). The prevalence is higher for Christian (12.3%) and Muslim (5.7%) women than for Hindu women (4.3%). Similarly, the prevalence of tobacco use is higher for women of scheduled tribe (13.2%) than for women of all other castes.⁹

Nationally representative data on tobacco consumption in India are from National Sample Survey (NSS), National Family Health Surveys (NFHS), and Global Adult Tobacco Survey (GATS-1 and 2). National Sample Survey organised by National Sample Survey Organization (NSSO) in 1995-1996 was the first nationally representative household survey to collect data on tobacco consumption in the population. Threshold prevalence of tobacco consumption in population then was 51.3% for men and 10.35% for women aged 15 years and above. GATS-India provides better understanding of the tobacco products consumed in India.

India is the second largest consumer of tobacco. GATS-2 reported that 28.6% of the population consume tobacco in any form, 10.7% smoke, and 21.4% use Smokeless Tobacco (SLT). Khaini (a form of SLT) and beedis are the dominant forms of tobacco consumed in India, at 11% and 8%, respectively.

Smoked form was consumed by 14% of the population. On an average, Indians smoked about 6.2 cigarettes per day; this is the lowest of all countries, but among women, although the prevalence of cigarette smoking was less, the mean cigarettes per day were quite high, about 7, higher than the average of men, which was 6.1.

Beedis accounted for the largest proportion of smoked tobacco consumed in India, especially among the lower socio-economic group, they consume beedis 8 to 10 times more than cigarette smoking. Despite greater consumption and higher toxicology associated with beedis, they go unnoticed.

Smokeless tobacco use is documented in 120 countries. India has the largest number of SLT users in the world. The prevalence of SLT use is higher among men (27%-37%) compared with women (10%-15%).

Secondhand smoke (SHS) exposure is a significant problem in India, at both indoor and outdoor. A study has shown that 70% to 80% of the male smokers regularly smoked in home; 3 in every 10 adults working indoor are exposed to SHS. About 23% of adults have reported SHS exposure at public places. In NFHS-3, 25% women reported SHS exposure at home. Secondhand smoke exposure has a bearing to be future smokers.⁸

Pregnant women worldwide also use other forms of tobacco, mainly in low income countries. In a study conducted among pregnant women in 9 developing countries revealed that the rate of current users of smokeless tobacco products was 6% in Democratic Republic of Congo (chewing tobacco and/or snuff), and was 33.5% in Orissa, India (chewing tobacco and/or tobacco tooth powder). Consistently, in another report from India, 31% of pregnant women used Mishri. In Beirut, nearly 7% of pregnant women smoke argileh, together with 20% of other Lebanese women who smoke cigarettes during pregnancy. More recently, a literature review showed that 17% of women in Mumbai use smokeless tobacco products during pregnancy (80% of them use Mishri), 7% of pregnant women in Johannesburg, South-Africa and in Sweden use snuff, while in the Alaska Native community of Canada, 50% chew tobacco.¹⁰

FACTORS INFLUENCING TOBACCO USE IN WOMEN:

Socio-cultural and socio-economic determinants of female smoking: Smoking has now come to represent socioeconomic disadvantage because low socio-economic status (SES), determined mainly by the level of education and household income, is among the strongest factors influencing smoking, both in men and women. In addition, evidence indicates that in women, lower SES is correlated with greater exposure to tobacco smoke at home.

Advertisement: An important factor prompting women to begin and continue smoking cigarettes is aggressive promotion of cigarettes. Advertisements addressed to women first appeared in USA in the 1920s. Tobacco advertising has used various means to attract women to cigarettes. The most important among these was the creation of a false image of smoking women and girls, introducing them in mass media as emancipated, successful, sophisticated, glamorous, enjoyable, sexually attractive, romantic, and slim.

Factors influencing smoking during pregnancy: Important determinants of smoking during pregnancy include psychosocial health attributes and other factors such as higher levels of perceived stress, depression, anxiety, neuroticism, self-efficacy, and personality characteristics, as well as negative paternal support or perceived racism. Studies also have shown an association between mental disorders and smoking during pregnancy and nicotine dependence among pregnant women. In a survey conducted in USA, 12% of women smoking during pregnancy met the criteria for nicotine dependence. Among all pregnant women smoking cigarettes, 45% of them met criteria for at least one mental disorder, including nicotine dependence.¹⁰

Several studies indicated that some women, including some pregnant women, perceive a benefit to using tobacco products. In India, many women who chew tobacco consider it to aid in performing manual labor, suppressing hunger, reducing toothache, relieving morning sickness and controlling labor pains.

A study of pastoralist women in Northern Kenya found that women (including pregnant women) chew tobacco regularly, believing that it calms the stomach and relieves hunger; chewing tobacco is given to children beginning at age three for similar reasons. Studies from India and other regions, have found that some pregnant women limit their food intake and adopt other strategies to help ensure a small baby and thus an easier delivery. The extent to which tobacco, often considered to be an appetite suppressant, is used in this way during pregnancy is not known. Pregnant women's lack of knowledge and misconceptions about physiology also play

a role in continued tobacco use. For example, a study from Lebanon reported that it is common for poorly educated women to believe that the fetus is ‘in a bag,’ and therefore protected from harm. Globally, many studies showed that women, particularly low-income women, use cigarettes to cope with stress. During pregnancy, women report concern that quitting will increase stress for the fetus and for themselves. In Lebanon, many pregnant women who continue to smoke believe that the withdrawal symptoms and the psychological distress of quitting smoking are more harmful to the fetus than their continued smoking.¹¹

Nepal S. and Rai S. conducted a cross sectional study on Prevalence and Factor Influencing Tobacco Smoking Behavior among Adult Women in Urban Squatter Settlement of Kathmandu which stated that the prevalence of tobacco smokers was 57.8% and current tobacco daily smokers, 35.5%. As compared to 20-29 years women, 50-59 years women were 1.1 times more likely to be smoker. As compared to divorced women married women were 3.2, never married women were 2.3 times more likely to be smoker. Likewise, as compared to student as occupation, service holder 12.5, daily labor 8.5, Farmer 5.4 times more likely to smoke. As compared to Buddhist, Christian and Hindu were 2.5 and 2 times more likely to be smoker. Similarly as compared to relatively upper caste ethnic group disadvantage and other ethnic group were 2.6 and 1 times more likely to smoke.¹²

IMPACT OF TOBACCO USE IN PREGNANCY AND CHILD DEVELOPMENT: There is growing, although still sparse, evidence that suggests an association between the use of some non-cigarette tobacco products during pregnancy and the increased risk of perinatal complications consistent with that found in pregnant women smoking cigarettes. Women users of Mishri had 2.7 times greater risk of abnormal delivery than non-users. Moreover, the birth weight was significantly lower compared to women who never used Mishri. Similarly, water pipe smoking and use of snuff were found to be strongly associated with lower birth-weight. Swedish pregnant women who were snuff users had increased risk of stillbirth, comparable to women who smoked 10 or more cigarettes daily during pregnancy, and had increased risk of preeclampsia compared with non-users.¹⁰

Getting pregnant: According to the American Society for Reproductive Medicine, those women who smoke and want to get pregnant, quitting the habit should be a priority. Smoking can prevent women from getting pregnant in the first place. Even in the first trimester smoking affects the health of the unborn baby. Both male and female smokers are about twice as likely to have issues with fertility compared to non-smokers.

Miscarriage and stillbirth: The unexpected loss of a pregnancy is a tragic event at any stage. Miscarriages typically occur in the first three months of pregnancy. On rare occasions, they can occur after 20 weeks of gestation. This is called a stillbirth.

According to the U. S. Centres for Disease Control and Prevention (CDC), smoking raises the likelihood of both early miscarriage and stillbirth. The dangerous chemicals in cigarettes are often to blame. Other complications from smoking can lead to problems with the placenta or slow fetal development. These issues can also cause a miscarriage or stillbirth.

Ectopic pregnancy: According to a research study nicotine can cause contractions in the fallopian tubes. These contractions can prevent an embryo from passing through. One possible result of this is an ectopic pregnancy. This happens when a fertilized egg implants outside of the uterus, either in the fallopian tube, or in the abdomen. In this situation, the embryo must be removed to avoid life-threatening complications to the mother.¹⁴

Smoking during pregnancy may be responsible for 15% of all preterm births and a 15% increase in overall perinatal mortality. Even in non-smoking pregnant women, high exposure to environmental tobacco smoke is associated with an increased risk for preterm birth. The relation between smoking and ectopic pregnancy might be causal, with a highly significant adjusted odds ratio of 2.5 or more for women who smoke more than 20 cigarettes a day.¹⁵

Placental abruption: The placenta is the “lifeline” structure that forms during pregnancy to provide the fetus with nutrients and oxygen. Smoking is a major risk factor for several complications linked to the placenta. One such problem is placenta abruption. This is a condition in which the placenta separates from the uterus before childbirth. Placenta abruption can cause severe bleeding and threaten the life of both the mother and the baby. There’s no surgery or treatment to reattach it. Immediate medical attention may help increase the chance of a healthy birth despite placenta abruption.

Placenta previa: Smoking is also a risk factor for placenta previa. During pregnancy, the placenta normally grows in the uterus towards the top of the womb. This leaves the cervix open for delivery. Placenta previa is when the placenta stays in the lower part of the uterus, partially or fully covering the cervix. The placenta often tears, causing excessive bleeding and depriving the fetus of vital nutrients and oxygen.¹⁴

In one study it was found that the rates of placental abruption in the first and second pregnancies were 0.49 percent and 0.41 percent, respectively. Women with an abruption in their first pregnancy were at a greater than 11-fold increased risk of developing a recurrent abruption.¹⁶

Preterm birth: According to the CDC, smoking during pregnancy can cause preterm birth. That's when a baby is born too early. There are numerous health risks associated with a preterm birth. These can include:

- Visual and hearing impairments
- Mental disability
- Learning and behavioral problems
- Complications that could result in death

Low birth weight: Smoking can also cause babies to be born with a low birth weight. This doesn't just mean delivering a small baby. Low birth rate can also lead to other health problems and disabilities. Advances in medical care have reduced the number of deaths as a result of low birth weight. But it's still a serious condition that can result in:

- Developmental delay
- Cerebral palsy
- Hearing or vision ailments

In extreme cases, low birth weight can cause the death of the newborn.

According to the American Cancer Society, women who quit smoking before getting pregnant lower their risk of having a baby with a low birth weight. Even women who stop smoking during their pregnancy are less likely to have babies with low birth weight than women who keep smoking.

Birth defects: Smoking during pregnancy raises the risk of the baby being born with birth defects. The most common types of problems are congenital heart defects and problems with the structure of the heart. Other health issues that have been linked to smoking while pregnant include cleft lip and cleft palate.¹³

Effects on Infant Growth: Maternal smoking during pregnancy has long been considered an important risk factor for Low Birth Weight. This association was first reported in 1957 and has been proven in numerous subsequent studies. Birth weight decreases in direct proportion to the number of cigarettes smoked, and children of smokers are 150 to 250 grams lighter than are the children of non-smokers. In a recent study of neonatal body composition, prenatal tobacco exposure was significantly related to having less fat-free mass, as measured by total body electrical conductivity. The authors concluded that the Low Birth Weight of infants exposed to prenatal smoking is primarily attributable to reduced fat-free mass or lean tissue. Birth length and head and chest circumference are also reduced in infants who are prenatally exposed to tobacco.

In another recent study by Zaren and colleagues on prenatal tobacco exposure and fetal growth, reported that the male fetus might be more adversely affected than the female fetus. In this study, fetuses of non-smoking, light smoking, and heavy smoking mothers were measured by sonograms at weeks 17, 25, 33, and 37. Boys born to heavy-smoking mothers had greater weight reductions, lower fat accretions, and smaller head circumferences when compared with girls of heavy smoking mothers.

Two key ingredients of cigarette smoke that are known to affect fetal growth are carbon monoxide and nicotine. Carbon monoxide causes fetal hypoxia, a reduction in the amount of oxygen available to the fetus, whereas nicotine can lead to a decrease in the flow of oxygen and other nutrients across the placenta by constricting uterine arteries. In addition, nicotine itself can cross the placenta to affect the fetal cardiovascular and central nervous systems (CNS). Other constituents of tobacco smoke (e.g., cadmium and toluene) have also been shown to cause fetal growth retardation.

Long-Term Effects on Growth: The effects of prenatal tobacco exposure on older children's growth are not as clear as the effects on infants. Using data from the Collaborative Perinatal Project, detected a small difference in height and head circumference in exposed children at age 7. One study found that exposed children were shorter than nonexposed children at age 14, and another study reported decreased height at ages 7, 11, and 23. In the latter study, the differences in height at age 23 were mediated by birth weight. These studies did not control for passive exposure to tobacco smoke or exposure to alcohol. A study of 714 three-year-old children found that the children of women who quit smoking during pregnancy were heavier and taller than those of women who did not quit. Adjustment for postpartum exposure to tobacco smoke reduced the difference in the children's weight, but had little effect on differences in height.

Other studies have not found growth retardation over the long-term. In addition, one study that followed infants from birth through 6.5 months and 13 months found that pre-natal alcohol exposure, rather than tobacco exposure, was associated with a slower growth rate when the exposed children were compared with unexposed children during the first 6.5 postpartum months. Although maternal smoking was correlated with shorter stature at 6.5 and 13 months, this effect was attributable to maternal drinking during pregnancy, highlighting the importance of controlling for the effects of other drugs.

Prenatal tobacco exposure may not only be related to size deficits at birth, but may also be associated with disproportionate weight (for height) among both infants and young children. For example, a recent study of more than 200,000 births in Sweden found that prenatal tobacco exposure was significantly associated with reduced birth length and birth weight. However, maternal smoking was also significantly associated with an

increase in ponderal index, an indication of higher proportionate weight for height, when birth weight and gestational age were controlled for. Thus, the children of smokers tended to be shorter and have a higher ponderal index than children of nonsmokers.

Effects on Cognitive Function: Studies have also reported adverse effects of prenatal tobacco exposure on cognitive and behavioral development in older children. In one study, cognitive functioning at age 3 was higher among the children of mothers who quit smoking during pregnancy than among children whose mothers smoked throughout pregnancy. Poor language development and lower cognitive scores have also been reported in 2-, 3-, and 4-year-old children prenatally exposed to tobacco. When those children were 9 to 12 years old, prenatal tobacco exposure was negatively associated with language and reading abilities. In another analysis of this same cohort of 9 to 12 year-olds, prenatal tobacco exposure had a negative, dose-dependent association with visual perception after consideration of other potential prenatal risk factors and of pre- and post-natal secondhand smoke exposures.¹⁴

CONCLUSION:

Early child development has major impacts on future human capital and health. In sum, the scientific evidence suggests that smoking during pregnancy is associated with a number of adverse effects on the growth, cognitive development and behaviour of exposed offspring. This emphasizes the importance of developing interventions to reduce prenatal smoking in order to enhance early child development, which represents an early form of human capital given its strong effects on cognitive and education outcomes later in life. Such interventions are expected to have positive effects on long-run human capital attainment given the importance and multiplicative effects of enhanced early development over life. Children in low Socio-Economic Status households may be more adversely affected and may benefit more from focused interventions to reduce prenatal smoking. Such interventions are particularly relevant given that low Socio-Economic Status in early life also reduces future human capital.

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