Title: Tobacco (Smoking or Smokeless) use among pregnant women and its contributing factors in India: A Maternal & Child Health Concern

Abstract

Background: High prevalence of tobacco use was found among pregnant women in India. The prevalence of tobacco use among pregnant women was found the highest in North-Eastern States to other states of India. The effect of tobacco use is not only limited to their general health but also reproductive health.

Objective: This study has three objectives to understand the prevalence and contributing factors with respect to use of any form of tobacco (smoking or smokeless). First objective of the study was to estimate national and state wise prevalence of tobacco use among pregnant females and to understand the cessation support received by them. Second objectives was to study the association between tobacco use among pregnant women, socio-demographic and economic factors and cessation support received by them. Third objective was to understand the contributing factors affecting tobacco use among poor and non-poor pregnant women.

Methods: This study utilized data from 4th round of National Family and Health Survey (NFHS-4, 2015-16). The relationship between tobacco use among pregnant women and socio-demographic and economic factors were assessed using Bi-variate logistic regression. Multivariate decompositions were applied to understand contributing factors with respect to tobacco use.

Results: Tobacco use during pregnancy was higher in women with no education [OR-CI,3.31(2.69-4.08)]. Significantly, higher tobacco use was seen in women of poorer socio-economic status [OR-CI,3.03(2.52-3.66)]. Pregnant women advised against tobacco use were less likely to continue tobacco use [OR-CI,0.80(0.56-1.16)].

Conclusion: Healthcare professionals and policy makers need to give special attention on tobacco use among pregnant women as it may create adverse impact on newborn.

Keywords: Pregnant Women, Tobacco Use, SES Factor, Tobacco Cessation, multivariate decomposition

Introduction

Tobacco is the single most preventable cause of mortality in the world today("WHO | WHO report on the global tobacco epidemic 2017," 2017). According to Global Adult Tobacco Survey there are 879 million current users of tobacco (smoking and smokeless). It accounts for nearly 8.1 million deaths, of which 1.9 million deaths were reported among women. Global prevalence of smoking tobacco ranges from 4% to 39% in low- and middle-income countries (LMIC's), while the prevalence of smokeless tobacco ranges from 0.9% to 18% in LMIC's. Tobacco usage is common to men in comparison to women, an estimated 5% and 40% of women and men were found to consume tobacco daily. Tobacco use among females have high potential of affecting their general and reproductive health(Srinath, Prakash, & Gupta, n.d.). Pregnant women are in particular a vulnerable group. Around 2.6% pregnant women reported the use of tobacco globally. Africa reported lowest prevalence (2%) while highest prevalence was seen in South East Asia (5.1%). As seen in GATS 2- India survey, 14.2% women reported using some form of tobacco. The current evidence estimates a significant prevalence of tobacco use among pregnant women (7.5%)(Ministry of Health and Family welfare, 2016).

Studies have documented the negative consequences of maternal tobacco use on foetal health, that might even prevail post parturition. Maternal tobacco use increases the risk of stillbirth(Marufu, Ahankari, Coleman, & Lewis, 2015), preterm birth(Dahlin, Gunnerbeck, Wikstr€, Cnattingius, & Bonamy, n.d.; Ion & Bernal, 2015), low birth weight(Ko et al., 2014; Mumbare et al., 2012), placental praevia and abruption(Lange, Probst, Rehm, & Popova, 2018; Shobeiri, Masoumi, & Jenabi, 2017), neurodevelopmental disorders(Ekblad, Korkeila, & Lehtonen, 2015; Polańska, Jurewicz, & Hanke, 2015) and has teratogenic effects on foetal development(Holbrook, 2016). Further studies have also described the effects of tobacco on gestational hypertension(England et al., n.d.), spontaneous abortion(Hyland et al., 2015; Mishra, Kulkarni, Gupta, & Shastri, 2015; Pineles, Park, & Samet, 2014). Literature suggests high prevalence of tobacco by South Asian women. Barakoti *et al*. studied the prevalence of tobacco use during pregnancy and revealed, that only one-fifth of the total participants were motivated to quit tobacco by health workers(Barakoti, Ghimire, Pandey, Baral, & Pokharel, 2017).

A study conducted in rural Jharkhand assessed pregnancy tobacco usage and its correlates. 90.5% pregnant women had attended one prenatal check-up, of which only 6.1% received advice on adverse effects of tobacco during pregnancy(Singh, Mini, & Thankappan, 2015). Panda *et al*. conducted a study pertaining to frontline health workers knowledge of tobacco cessation in the Gujarat and Andhra Pradesh. It was estimated that less than 10% Auxiliary Nurse Midwife (ANM) provided counselling to patients seeking antenatal care(Panda et al., 2015). Bloch et al has described pregnancy as a *'window of opportunity'* for tobacco cessation(Bloch & Parascandola, 2014). Periodic clinic visits and cessation counselling have been defined as teachable moments to impart cessation counselling(McBride, Emmons, & Lipkus, 2003). Literature suggests counselling from health professionals as an effective tool to support tobacco cessation practices. Although studies have looked at tobacco use among pregnant women and cessation support received. There is a paucity of literature assessing tobacco cessation practices at the primary health care level among pregnant women in India. In this context, the study aims to assess the prevalence and determinants (socio- demographic and socio-economic) of tobacco use among pregnant females and to observe the cessation support received by them.

Methods

This study utilizes data from National Family Health Survey of India (NFHS-4, 2015-16) which was conducted in 2015-2016 by Ministry of Health and family Welfare, Government of India. NFHS is an Indian version of the demographic and health Survey (DHS). The NFHS-4 sample is a stratified two stage sample. Separate questionnaires were used for men, women and households. 699,686 women participated in the survey. This study included only currently pregnant women(n=32,428). The data collected for the variables was self-reported. The details of the study, methods, sampling frame and questionnaire have been mentioned elsewhere(*NATIONAL FAMILY HEALTH SURVEY (NFHS-4) 2015-16 INDIA*, 2017).

Outcome and Predictor variables

The question used to determine tobacco consumption was *"In what form do you currently smoke or use tobacco?"*. The variables, 'currently smokes bidis(s707)', 'smokes cigarettes(v463a)', 'smokes pipe(v463b)', 'uses chewing tobacco(v463c)', 'guthka/paan masala with tobacco(v463f)' and 'paan with tobacco(v463g)' were clubbed and dichotomized into one variable as: Consumption of any form of tobacco(tobacco), which was used in this study. The predictor variables used were 'highest educational level(v106)', 'education in single years(v133)', 'wealth index(v190)'. The variable 'education in single years' was categorized as '< 10 years' of schooling, '10 years' of schooling and '>10 years' of schooling, and variable 'wealth index' which was categorized as 'poorest', 'poorer', 'middle', 'richer' and 'richest' in the existing data, was recatergorised as 'poor' and 'non-poor'. Exposure to media was also included as predictor variable. The questions included in the analysis to assess exposure to media were *"Do you read a newspaper/ or magazine?"* and *"Do you watch television?"*. The responses were dichotomized as respondents reading newspaper and watching television (daily, weekly, occasionally) and respondents reporting not reading newspaper and watching television (never). The variables for the tobacco cessation behavior were also included in the analysis as they have been reported to be associated with the consumption of tobacco. The question was asked as "*During the past 12 months, have you ever tried to stop smoking or using tobacco in any other form?*". The variable was categorized as: respondents who tried to stop smoking or using any form of tobacco or respondents who did not try to stop smoking or using any form of tobacco for the analysis. The other variable was asked as *"During any of these visits, were you advised to quit smoking or using tobacco in any other form?"*. This was also categorized as: respondents who were advised to quit smoking or respondents who were not advised to quit smoking.

Statistical Analysis-

Descriptive analyses were carried out to calculate the frequency distribution of categorical variables for the sample. Bi-variate analysis was done to understand the differences between the use of tobacco and the predictor variables using Pearson's Chi square test at 5% significance level.

Bi-variate logistic regression was used to study the association between predictors (categorical) and dichotomous outcome variable, i.e. tobacco (0 = Not using any form of tobacco, 1 = Using any form of tobacco).

Mathematical formulation of the Bi-variate logistic regression models is given below-

$$\log((P_k/(1\text{-}P_k)) = \alpha i + \beta j * xj$$

where, $P_{i=}$ Probability of tobacco consumption among pregnant women (k=1, 2, 3, 4, 5)

$$xj, (j=1, 2, 3, 4, 5) \text{ are predictors}$$

$$\beta 1 \ldots \ldots \beta j \text{ are coefficients , } j = 1, 2, 3, 4, 5$$

$$\alpha 1, \alpha 2, \ldots \alpha i \text{ are intercepts, i=0,1,2, 3, 4, 5}$$

State wise map based on prevalence of tobacco use among pregnant women was created in STATA software through the packages 'shp2dta'(package used to convert .shp file into .dta format) and 'spmap' (specially designed to visualize spatial data). The package 'mvdcmp' was used to estimate the contributing factors affecting tobacco use among pregnant women. The package 'mvdcmp' was primarily made for use in non-linear decomposition and was based on recent contributions, which include convenient method to handle path dependency, calculating asymptotic standard errors, and overcoming the identification of problem associated with the choice of a reference category when dummy variable are included among the predictors(Powers, Yoshioka, & Yun, 2011). The technique of decomposition was used to the know the contributing factors affecting (directly or indirectly) or may affect the tobacco use among pregnant women. All statistical analyses were performed using STATA (Stata Corp LLC, version 13.0).

Mathematical formulation of the overall decomposition has given below-

$$Z = G(Y\sigma)$$

Where Z= n* 1 dependent variable vector [use of any form of tobacco (dependent variable)]

Y= n*k matrix of independent variables and σ is k*1 vector of coefficients

G(.) is any once-differential function mapping a linear combination of Y$(Y\sigma)$ to Z

The mean difference in Z between two groups H (pregnant women) and I (non-pregnant women) can be decomposed as –

$$Z_H - Z_I = G(Y_H\,\sigma_H) - G(Y_I\,\sigma_I)$$

$$Z_H - Z_I = \{G(Y_H\,\sigma_H) - G(Y_I\,\sigma_H)\} + \{G(Y_I\,\sigma_H) - G(Y_I\,\sigma_I)\}$$

$$\quad\quad\quad\quad\text{E}\quad\quad\quad\quad\quad\quad\quad\quad\text{C}$$

Here component 'E' refers to the part of the differential attributable to difference in endowments or characteristics while, 'C' refers to the part of the differential attributable to differences in coefficients. Here, I had selected H as the comparison group and I as the reference group.

Results-

Descriptive Statistics of the Respondents:

Around 6.4 percent pregnant women in India use any form of tobacco. Mean age at tobacco consumption among pregnant women was calculated as 24.7 years. A negative association was found between educational attainment and tobacco use. An estimated 8.4% pregnant women with no education consumed tobacco which was more in comparison to women with higher education. Similarly, for women belonging to poorest/poorer socio-economic status, percentage of tobacco consumption was higher with respect to those belonging to other socio-economic sections. Exposure to media is found to influence tobacco consumption among pregnant women. (Table1).

Table 1: Prevalence of tobacco use among pregnant women with Chi-Square test of association by selected background characteristics (NFHS-4, 2015-16)

Background Characteristic	tobacco (N=32,428)		Total	Chi-Square (Sig)
	Yes	No		
Educational level n (%)				
No education	687(8.4)	7,462(91.6)	8,149	
Primary	375(8.8)	3,905(91.2)	4,280	
Secondary	905(5.6)	15,169(94.4)	16,074	p<0.000
Higher	106(2.7)	3,819(97.3)	3,925	
Reading Newspaper/Magazine n (%)				
No	1,411(6.7)	19,588(93.3)	20,999	p<0.000
Yes	662(5.8)	10,767(94.2)	11,429	
Listen Radio n (%)				
No	1704(6.2)	25891(93.8)	27,595	p<0.000
Yes	369(7.6)	4464(92.4)	4,833	
Watching TV n (%)				
No	710(7.2)	9,179(92.8)	9,889	p<0.000
Yes	1,363(6.1)	21,176(93.9)	22,539	
Wealth Index n (%)				
Poorest	625(8.1)	7,058(91.9)	7,683	
Poorer	622(8.2)	6,994(91.8)	7,616	
Middle	413(6.3)	6,184(93.7)	6,597	p<0.000
Richer	272(4.9)	5,303(95.1)	5,575	
Richest	141(2.8)	4,816(97.2)	4,957	
During visit with health provider, respondent advised to quit smoking or using tobacco (%)				
No	1852(5.8)	30291(94.2)	32,143	p<0.000
Yes	221(77.5)	64(22.5)	285	
Tried to stop smoking or using tobacco in last 12 months n (%)				
No	1510(4.8)	30183(95.2)	31,693	p<0.000
Yes	563(76.6)	172(23.4)	735	
Total	2073(6.4)	30,355(93.6)	32428	
Mean age for tobacco consumption - 24.7 years				

Factors associated with tobacco use during pregnancy:

Results of Bivariate logistic regression suggested that the socio-economic, demographic factors and exposure to media were associated with consumption of tobacco among pregnant women. Respondents with no education [OR-CI, 3.31(2.69-4.08)] and only primary education [OR-CI, 3.45(2.77-4.31)] are more likely to use tobacco in comparison to those with higher education. Pregnant women belonging to poorer socio-economic status are three times more likely to consume tobacco [OR-CI,3.03(2.52-3.66)]. Those belonging to middle socio-economic status are two times likely to use tobacco [OR-CI,2.28(1.87-2.77)]. Pregnant women who are advised against smoking or tobacco use are less likely to consume tobacco [OR-CI,0.80(0.56-1.16)]. Similarly, pregnant women who tried to stop smoking or using tobacco in last 12 months were less likely to consume tobacco [OR-CI,0.93(0.76-1.14)]. (Table 2).

Table 2: Logistic regression showing predictors of tobacco use among currently pregnant women

tobacco (Outcome variable)	Odds Ratio	[95%Conf.Interval]	
Predictors			
Education n (%)			
Higher®			
Primary	3.45***	2.77	4.31
Secondary	2.14***	1.75	2.63
No Education	3.31***	2.69	4.08
Wealth Index n (%)			
Richest®			
Richer	1.75***	1.42	2.15
Middle	2.28***	1.87	2.77
Poorer	3.03***	2.52	3.66
Poorest	3.02***	2.51	3.64
Mass media exposure			
Reading Newspaper/Magazine			
No®			
Yes	0.85***	0.77	0.93
Listening Radio			
No®			
Yes	1.25***	1.11	1.41
Watching Television			
No®			
Yes	0.83***	0.75	0.91
During visit with health provider, respondent advised to quit smoking or using tobacco			
No®			
Yes	0.8	0.56	1.16
Tried to stop smoking or using tobacco in last 12 months			
No®			
Yes	0.93	0.76	1.14

®: Reference, ***: P<0.00

Fig.1 reveals spatial distribution of prevalence of tobacco use among pregnant women across Indian states. It is clear from the spatial distribution that most of the women living in North-Eastern parts of India consume more tobacco during pregnancy than other parts of India. More than half (58.28%) of women use tobacco in Mizoram (highest among North-Eastern states). Twenty-five percent women living in Andaman & Nicobar Islands consume tobacco (any form of tobacco), which is the highest among than other union territories. Low prevalence of tobacco use among pregnant can be observed in Southern states.

Fig.1 Spatial distribution of prevalence of tobacco use among pregnant women across Indian States (NFHS-4, 2015-16)

Prevalence of tobacco use among pregnant women accross Indian States

Jammu & Kashmir
0.47

Himachal Pradesh
0.31
Punjab
Chandigarh
Haryana 0.27 0.00
Uttarakhand
0.58 1.91

NCT of Delhi
0.00

Sikkim
0.62

Arunanchal Pradesh
13.19

Uttar Pradesh
5.22

Assam Nagaland
15.17 21.46
Meghalaya
32.14

Rajasthan
4.84

Bihar
1.04

Manipur

Madhya Pradesh
6.15

Jharkhand
0.15 1.67

Tripura
25.15
38.95

Mizoram

Gujarat
6.02

Chhattisgarh
3.11 Odisha
5.59

West Bengal

Daman & Diu 0.00

2.86 Maharashtra
2.44

Dadara & Nagar Haveli

Telangana
0.00

Goa
0.00 Karnataka
0.84

Andhra Pradesh
0.58

Puducherry

0.00

Legend

(35.0 , 60.0]
(30.0 , 35.0]
(25.0 ,30.0]
(20.0, 25.0]
(15.0, 20.0]
(10.0,15.0]
(5.0,10.0]
[<5.0]

Andaman & Nicobar Islands
25.00

Lakshadweep
4.55

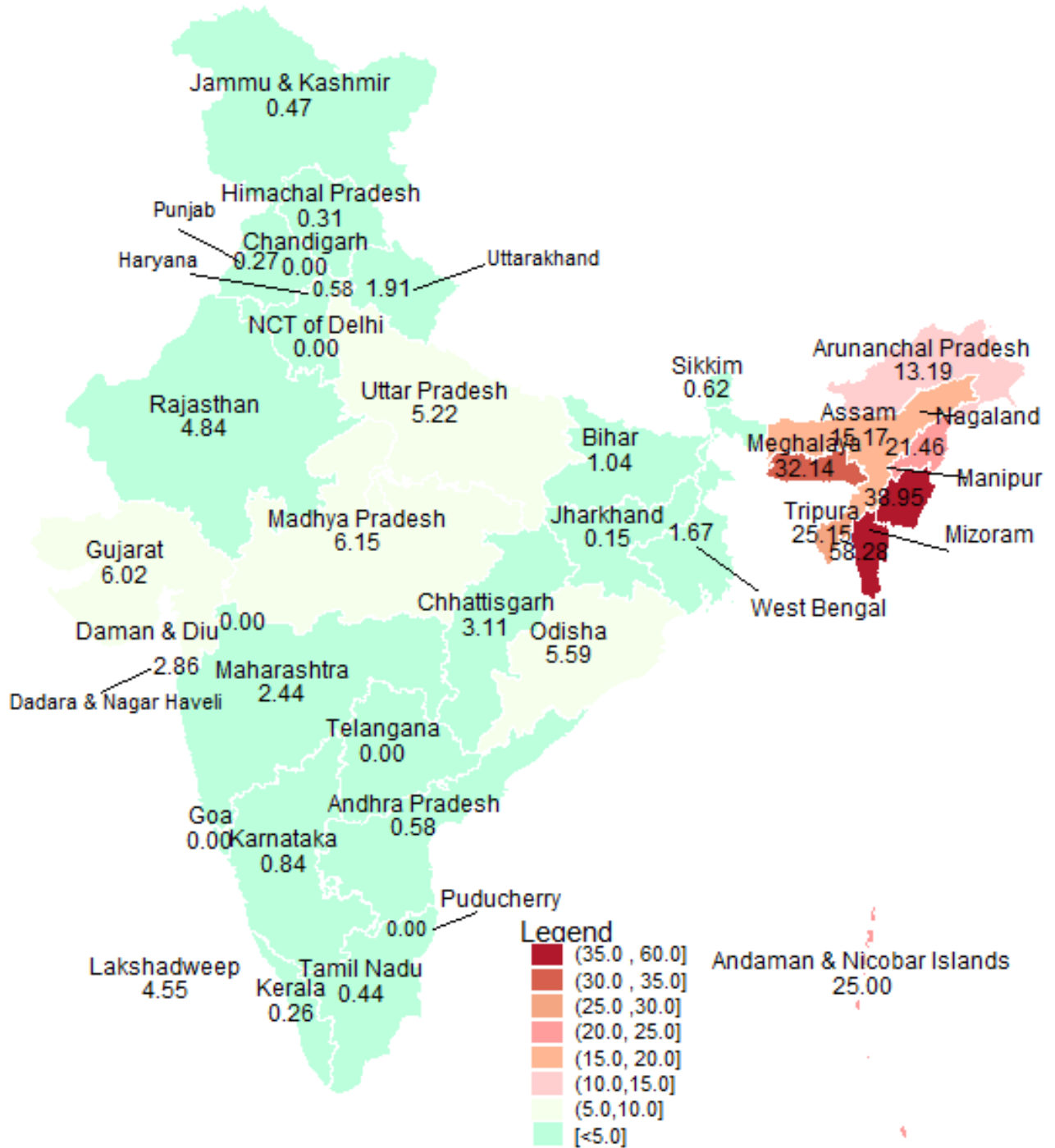Tamil Nadu
Kerala 0.44
0.26

Table-3: Results of Multivariate decomposition showing contributing factors affecting tobacco consumption among poor and non-poor pregnant women (NFHS-4, 2015-16)

High outcome group: poor==1 --- Low outcome group: non-poor==0							
tobacco	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]		Pct.
E	0.0183	0.0020	9.03	0.0000	0.0143	0.0222	49.91
C	0.0183	0.0029	6.36	0.0000	0.0127	0.0240	50.09
R	0.0366	0.0023	16.10	0.0000	0.0321	0.0411	
Due to Difference in Characteristics (E)							
tobacco	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]		Pct.
Years of schooling							
< 10 years	0.0170	0.0038	4.44	0.0000	0.0095	0.0245	46.38
>10 years	0.0041	0.0040	1.02	0.3070	-0.0037	0.0119	11.10
Media Exposure							
newspaper/magazine	-0.0056	0.0023	-2.47	0.0130	0.0101	-0.0011	-15.40
tv	0.0004	0.0016	0.23	0.8150	-0.0027	0.0035	1.01
radio	-0.0008	0.0002	-3.64	0.0000	-0.0012	-0.0003	-2.19
Tried to stop smoking or using tobacco in last 12 months	0.0006	0.0001	9.14	0.0000	0.0005	0.0007	1.57
During visit with health provider, respondent advised to quit smoking or using tobacco n (%)	0.0027	0.0002	12.47	0.0000	0.0023	0.0032	7.44
Due to Difference in Coefficients (C)							
Years of schooling							
< 10 years	0.0017	0.0025	0.67	0.5020	-0.0032	0.0066	4.58
>10 years	0.0021	0.0039	0.54	0.5920	-0.0055	0.0096	5.65
Media Exposure							
newspaper/magazine	-0.0030	0.0031	-0.95	0.3440	-0.0091	0.0032	-8.06
tv	-0.0158	0.0107	-1.47	0.1430	-0.0368	0.0053	-43.04
radio	0.0016	0.0010	1.59	0.1110	-0.0004	0.0035	4.26
Tried to stop smoking or using tobacco in last 12 months	-0.0002	0.0001	-2.54	0.0110	0.0004	-0.0001	-0.64
During visit with health provider, respondent advised to quit smoking or using tobacco n (%)	-0.0006	0.0001	-5.47	0.0000	0.0008	-0.0003	-1.70
_cons	**0.0326**	**0.0125**	**2.6**	**0.0090**	**0.0081**	**0.0571**	**89.04**

Table-3 shows that both endowment and coefficient are significant among high outcome group(poor). Differences in effects account for 50% of the observed poor-non-poor differential in the prevalence of tobacco use among pregnant women, with differences in intercepts (baseline logits). As per the convention, positive E_k coefficient indicates the expected reduction in the poor-non-poor tobacco consumption among pregnant women if poor were equal to non-poor on the distribution of Y_k. A negative C_k coefficient indicates the expected increase in poor-non-poor gap if poor had the same return of the risk or behavioral responses, as non-poor(Powers, Yoshioka, & Yun, 2011). On equalizing the level of education among pregnant women, tobacco consumption can be reduced by 46 % among pregnant women who completed less than 10 years of schooling. Percentage contribution of exposure to audio-visual media i.e., television(tv) was around 1%. This suggests us that increasing awareness through television may be effective for reducing tobacco use among pregnant women. The percentage contribution of advice to quit tobacco was around 7.4 %, suggesting that counselling/advice on tobacco quit during visit with health care providers may reduce tobacco consumption during pregnancy.

Conclusion:

It is concluded from the study that Evidence-based targeted interventions which are sensitive to the need of women belonging to different sections of society in India, may help to reduce tobacco consumption among pregnant women. The study confirms that the poor socio-economic status (SES) and lower educational level of women may increase the risk of tobacco consumption. Pregnant women belonging to the poorer sections of the society may face higher exposure to tobacco's harm. Therefore, targeted cessation programs and mass media interventions can lower the chances of tobacco use among women during pregnancy. Tobacco cessation counselling at primary healthcare settings may help in behavior change related to tobacco among pregnant women. Healthcare professionals and policy makers need to give special attention to the issue to curb tobacco consumption during pregnancy.

Discussion:

Globally tobacco has been recognized as the leading cause of non-communicable diseases and accounts for nearly 8 million deaths every year. A huge fraction of the tobacco users is derived from low and middle-income countries. WHO along with several countries have identified tobacco as a threat to public health and highlighted its increased usage among pregnant women. India since NFHS-3(*NATIONAL FAMILY HEALTH SURVEY (NFHS-3) INDIA VOLUME I*, 2005) has observed minor changes in maternal tobacco use. This study has analyzed a large-scale population based, nationally representative cross-sectional data to understand the consumption of tobacco and its associated covariates in India. The findings have established a clear association between socio-demographic and economic factors such as education, media (print media and television) and wealth index which are associated with maternal tobacco use. It has been observed that all these factors influence the behavior associated with tobacco consumption. The study also highlights the cessation practices tobacco cessation practices at primary healthcare settings.

A wide range socio demographic and economic factors can be credited to the consumption of tobacco among pregnant women. Studies have discussed the significant use of tobacco among the disadvantageous groups of the society(Hiscock, Bauld, Amos, Fidler, & Munafò, 2012) and findings are suggestive of the same . Women no or only primary education were more prone to tobacco misuse. A negative association between education and tobacco use among pregnant women(Kandel, Griesler, & Schaffran, 2009). This maybe attributable to psychological differences, awareness, and lack of ability to recognize the potential harm from tobacco. The use of tobacco among pregnant women has also been attributed to various misconceptions and myths. It is believed that tobacco suppresses hunger, contains medicinal properties which help them maintain oral hygiene, digestion, inflammation, morning sickness, labor pains and suppress hunger. Some studies have defined pregnancy as a "*teaching moment*", pregnancy is often a cause for strong motivation to protect the well-being of the fetus or infant and the social pressure to avoid tobacco use during pregnancy(Bloch & Parascandola, 2014).

Another important factor that influences the tobacco usage behavior is the counselling received by the pregnant women during their antenatal visits. According to this study it has been observed that women who had been advised against tobacco use were less likely to continue indulging in the practice. Counselling by healthcare personnel in primary health settings serves as a effective opportunity to sensitize them about the detrimental effects of tobacco on their and their unborn child's health. The study results may be considered with certain limitations. The study definition includes smoking bidis, cigarettes, pipe and consumption of guthka/paan masala with tobacco only. The reliance on self-reported data might have resulted in underestimation of actual number of pregnant tobacco users as, tobacco use by women is a perceived taboo in India. Also, the cross-sectional study design bears its inherent limitations, which needs to be considered while interpreting the results. Global prevalence of tobacco use imposes a threat to the present and future of public health. WHO has identified four approaches to tackle the tobacco epidemic: counselling at the primary health level, national quit tobacco toll-free helplines, nicotine replacement therapies and the use of technology to empower those who want to quit(*Offer help to quit tobacco use fresh and alive*, 2014). In the Indian context tobacco control among pregnant women requires attention.

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