Tobacco exposure is a menace among women: – A cross-sectional study in a rural area of West Bengal, India

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ABSTRACT

Context: In India, despite implementation of the strategies under National Tobacco Control Programme [NTCP], women are easily exposed to tobacco consumption that is smokeless (SLT) and smoking tobacco along with second-hand smoke [SHS], making them highly susceptible to tobacco hazards. **Aims:** This study aimed to assess the exposure of women to tobacco use and SHS at home and to elicit predictors of tobacco exposure in a rural community of West Bengal. **Methodology:** A community based, cross-sectional study was conducted among 176 women aged 18 years and above. Data was collected by cluster sampling technique (16*11) using predesigned pretested structured schedule. Tobacco exposure was measured using a composite score including tobacco consumption and SHS at home. **Results:** Tobacco use (SLT and smoking tobacco) was significantly associated with educational attainment [AOR = 2.12], occupation [AOR = 2.13] and knowledge [AOR = 1.22]. There was significant association between SHS at home with knowledge [AOR = 1.16] and attitude of the study subjects. [AOR = 1.93]. Overall tobacco exposure (SLT, smoking tobacco, and SHS), was found to be 79.5%. Significant association was found between high tobacco exposure with age group [AOR = 3.82], educational attainment [AOR = 1.74] and knowledge regarding hazards of tobacco [AOR = 1.31]. **Conclusion:** Prevalence of SLT use as well as exposure of women to SHS at home is unexpectedly high in the study population. Women specific information and education campaigns focusing on tobacco hazards (both tobacco use and SHS) through existing primary health care infrastructure should be strategized under NTCP.

Keywords: India, secondhand smoke, smokeless tobacco, tobacco exposure, women

Introduction

The tobacco exposure is among the major public health epidemic, leading to around 8 million deaths per year worldwide.[1] Global Adult Tobacco Survey, 2016-17 (GATS2) in India showed adult tobacco exposure is more in rural as compared to urban and peri-urban areas.[2] Every third rural adult and fifth urban adult are currently consuming tobacco.[3] Tobacco smoking is important causative risk factor for lung and oro-pharyngeal cancers. On the other hand, smokeless tobacco can lead to oral, pancreatic, oesophageal, and other digestive tract cancers.[4] Apart from cancer, long-term tobacco consumption may lead to chronic pulmonary diseases, cardiovascular and cerebrovascular diseases, diabetes, weak immunity, and increased susceptibility to lung infections.[4] These hazards of smoking are not limited to the user but also affect non-smokers as second-hand smoke [SHS].[5] Women are more prone to tobacco hazards due to additional burden of gender-specific morbidities like

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malignant lesions in breast, cervix, endometrium etc., adverse reproductive, and pregnancy outcomes.[6] Nearly 20% of all cancer among females is attributable to tobacco.[7] In India, due to social stigma, smoking tobacco [ST] is not prevalent among women (2% in rural and 0.8% in urban).[3] On the contrary, smokeless tobacco [SLT] is commonly used among women of all ages (14.3% in rural and 8.3% in urban).[3] Around two-fifth of rural women (39.3%) are exposed to second-hand smoke at home[8] and women are at more risk to second-hand smoke than men.[9] Due to lack of awareness regarding hazards of tobacco use and SHS, poor healthcare seeking behavior is observed among females especially in low and middle income countries.[10,11]

To cope with tobacco menace in India, National Tobacco Control Programme (NTCP) was launched in 2007–2008, aimed to create awareness about the harmful effects of tobacco consumption, to help to quit tobacco, and to facilitate prevention and control of tobacco promoted by WHO Framework Convention of Tobacco Control (WHO-FCTC).[12] Despite of various initiatives taken by Government of India, tobacco exposure is still prevalent in India, both in smoking and smokeless form. Despite of smoking restrictions in public places and workplaces, Indian households are not protected to SHS.[13] Thus, home remains a predominant source of exposure to SHS, particularly among women and children who spent a large time indoor.[14] Furthermore, ignorance about the specific harms to women's health due to tobacco exposure has made them highly susceptible to the harmful effects of tobacco. With this background, the present study aimed to assess the magnitude of tobacco exposure, in respect of tobacco consumption and exposure to second-hand smoke at home among adult women in a rural area of Hooghly district, West Bengal and to find out factors associated with it.

Subjects and Methods

A community-based observational cross-sectional study was conducted for four months (June to September 2019) in the rural field practice area of our institute at Singur, Hooghly district West Bengal, comprising 64 villages with total population of 99,229 according to Census 2011.

The study population comprised of women (aged ≥ 18 years), residing for at least one year in the study area. Those who were not willing to participate in the study and those who were critically ill at the time of study were excluded.

Sample size

According to GATS2, in West Bengal, 51.2% of non-smoker women are exposed to tobacco smoke at home and 17.9% of women use tobacco.[3] Taking 95% confidence interval, Z = 1.96; estimated prevalence (P) = 69.1% (51.2% + 17.9%), absolute error (d) = 10%, the sample size was estimated as 82. With design effect of 2 the final sample size was 176 (16*11 cluster sampling)

Sampling technique

From the list of 64 villages with cumulative population, 16 villages (clusters) were selected by Probability Proportional to Population size. From the selected cluster, one house was chosen randomly in a randomly selected direction. A house with at least one women was considered as first house. If more than one woman were present, then one was chosen randomly. Subsequent subjects were chosen consecutively from neighborhood. In case of end road, sample from next lane was taken. This process was continued till all the 11 study subjects were covered in one cluster. The same procedure was followed in all the selected 16 clusters.

Study tools and technique

Data was collected by face to face interview of participants using a pre-designed, pre-tested structured schedule (Bengali version). Face validity, content validity, and linguistic validity of the instrument was evaluated by experts of our institute.

Study variables
Dependent variables
1. *Tobacco use* (both smoking tobacco [ST] and smokeless tobacco [SLT] consumption).
2. *Second hand tobacco exposure at home* [SHS]
3. *Total (Overall) tobacco exposure* (ST, SLT, SHS) - Computed by Tobacco Exposure Score or TES. Each participant was given a score. The attained score was dichotomized on the basis of median as low exposure (< median score) and high exposure (≥ median score). Low exposure category also included those who were not exposed to tobacco. TES was calculated as follows:

Tobacco Exposure Score [TES] = ST SCORE + ST score + SHS score

$$SLT\ SCORE\ = \frac{\begin{pmatrix} average\ frequency\ per\ day \end{pmatrix}\ *\ \begin{pmatrix} duration\ of\ exposure\ in\ years \end{pmatrix}}{Upper\ limit\ of\ attained\ product} * 100$$

$$ST\ SCORE\ = \frac{\begin{pmatrix} average\ bidi\ /\ cigarette\ per\ day \end{pmatrix}\ *\ \begin{pmatrix} duration\ of\ exposure\ in\ years \end{pmatrix}}{Upper\ limit\ of\ attained\ product} * 100$$

$$SHS\ SCORE\ = \frac{\begin{pmatrix} duration\ of\ exposure\ in\ years \end{pmatrix}}{Upper\ limit\ of\ exposure\ years} * 100$$

- To provide equal weightage to SLT, ST and SHS scores, raw scores were divided by upper limit of attained raw score and multiplied with a common multiplier 100

Independent variables
1. Socio-demographic variables (age, education, occupation, and socioeconomic status according to modified B.G. Prasad scale 2019);
2. Knowledge regarding hazards of tobacco exposure [4 items] were scored. Those who responded "yes" (satisfactory)

were given score 1, otherwise (unsatisfactory) 0. Maximum and minimum attained score were 4 and 0; the scores were dichotomized for knowledge (score of ≥3 → Satisfactory knowledge; <3 → Unsatisfactory knowledge), taking 75th percentile of attained score as the cut of.

3. Attitude regarding tobacco exposure [5 items; based on 3-point Likert scale] were scored. The responses were "agree" (score 1), "neutral" (score 2), and "disagree" (score 3). Two items were reversely scored. Maximum and minimum attained score were 15 and 3; the scores were dichotomized for attitude (score ≥13 → Favorable attitude; score <13 → Unfavorable attitude), taking 75th percentile of attained score as the cut off.

Data analysis

Data were analyzed using Microsoft Excel 2007 and Statistical Package for the Social Sciences version 16 (SPSS for Windows, version 16.0, SPSS Inc. Chicago, USA). Descriptive statistics and logistic regression analyses were performed. All the significant ($P < 0.05$) explanatory variables of high TES, tobacco use, and SHS exposure obtained from univariate analysis were entered into multivariable regression model.

Operational definition

1. Smokeless Tobacco [SLT]: Tobacco that is consumed in un-burnt form, either orally or nasally.[3]
2. Second-hand smoke [SHS]: Secondhand smoking is environmental tobacco smoke formed from the burning of cigarettes and other tobacco products and from smoke exhaled by the smoker.[5]

Ethical approval

Current study was approved by Institutional Ethics Committee of AIIH&PH, Kolkata 11-10-2018. Informed written consent was obtained from each participant prior the data collection procedure. Confidentiality and privacy of subjects was maintained.

Results

Background characteristics

Mean ± SD age of study population was 42.5 ± 14.2 years with a range 18 to 70 years. Among study subjects, 64.2% were in reproductive age groups and 15.3% were elderly. Mean ± SD

years of schooling was 7.8 ± 4.4 years with 16.5% illiterate study subjects. Almost two-third (61.4%) were housewives and 36.4% worked for pay. Nearly half (46.2%) belonged to Class IV [1051-2101 INR] socioeconomic status in Modified B.G. Prasad scale 2019.[15]

Magnitude of tobacco exposure

The total proportion of tobacco exposure (including both tobacco use and SHS at home) among rural women was found to be 79.5%. Among them, 44.3% were exposed to only SHS at home, 29% to both SLT and SHS at home, 4% only SLT use. Remaining 1.1% was exposed to smoking tobacco, smokeless tobacco as well as SHS at home. Around one fifth (20.5%) of the total women were not exposed to tobacco.

Tobacco exposure score [TES] was computed to quantify total tobacco exposure in rural women. Median (IQR) of TES was 43.1 (76.9–12.1). Range of attainable score was 300 to 0. Maximum and minimum attained score was 245.4 and 0, respectively. Nearly half of them (51.2%) had high tobacco exposure [Table 1 and 2].

Smokeless tobacco (SLT) consumption

Among the total tobacco consumers (34.1%) [Table 2], 81.7% used only gul, 15% only khaini and 3.3% of the participants used both khaini and bidi. Majority (%) of the participants started SLT consumption within age group of 10 to 19 years, 37.1% of the study participants' self-initiated SLT consumption and 70.8% used to buy SLT by themselves. Two study participants gave up SLT consumption after being diagnosed with cancer.

Knowledge and attitude regarding tobacco exposure

Around half (56.8%) had knowledge about ill effects of smoking whereas nearly one third (37.5%) reported about harms of SLT use. Only 26.7% had knowledge about harmful effects of second-hand smoke exposure [Tables 3 and 4]. Unsatisfactory knowledge (65.3%) and unfavorable attitude (61.4%) were present in most of the subjects [Table 1].

Predictors of tobacco use (SLT and smoke tobacco)

In univariate logistic regression analysis, respondents' occupation, education, knowledge, and attitude were found significant. However, on Multivariable regression, education, occupation,

Table 1: Assessment of TES, Knowledge and Attitude of the participants					
ITEMS	ATTAINABLE		ATTAINED		ANALYSIS
	Minimum	Maximum	Minimum	Maximum	
TES	0	300	0	245.4	*High Exposure=48.8% **Low Exposure=51.2%
Knowledge	0	4	0	4	#Satisfactory=34.7% ##Unsatisfactory=65.3%
Attitude	3	15	3	15	$Favourable=38.6% $$Unfavourable=61.4%

*≥ median score; **< median score, #≥ 75th percentile of knowledge score; ##< 75th percentile of knowledge score, $≥75th percentile of attitude score; $$<75th percentile of attitude score

and knowledge continued to remain significant covariates. The logistic regression model showed a good fit (Hosmer–Lemeshow test, *P* value = 0.68). The independent variables predicted 22.8% to 24.2% variance of the dependent variable as revealed by Cox and Snell R² and Nagelkerke pseudo R² value for the model respectively [Table 5].

Predictors of second-hand smoking (SHS) at home

Respondents' education, knowledge, and attitude were found significant on univariate logistic regression. Multivariable logistic regression model showed that odds of SHS exposure at home was 1.25 time higher in those rural women who had unsatisfactory knowledge than those with satisfactory

Table 2: Descriptive Statistics of Type of Tobacco Exposure Among Participants

*Type of tobacco exposure	Person exposed *n* (%)	Duration of exposure [in years]	Average frequency per day
Smokeless Tobacco consumption	60 [34.1]	Mean (SD) = 7.9 (14.1) Median (IQR) = 0 (11.75-0) Range=0-58	Mean (SD) = 1.9 (2.9) Median (IQR) = 0 (4-0) Range=0-10
Smoking Tobacco consumption	2 [1.1]	Mean (SD) = 0.4 (2.6) Median (IQR) = 0 (0) Range=0-33	Mean (SD) = 0.1 (0.6) Median (IQR) = 0 (0) Range=0-6
SHS exposure at-home	131 [74.4]	Mean (SD) = 24.8 (20.0) Median (IQR) = 23.5 (42-0) Range=0-61	-

*: Multiple response

Table 3: Distribution of Study Participants as per Knowledge Regarding Harms of Tobacco Exposure [*n*=176]

Item no.	Questions	Yes *n* (%)	No *n* (%)	Don't know *n* (%)
1	Does smoking tobacco cause serious illness?	100 [56.8]	37 [21.0]	39 [22.2]
2	Does smokeless tobacco cause serious illness?	66 [37.5]	48 [27.3]	62 [35.2]
3	Does breathing other people's smoke cause serious illness?	47 [26.7]	87 [49.4]	42 [23.9]
4	Does smoking tobacco near pregnant female cause any harm?	123 [69.9]	19 [10.8]	34 [19.3]

Table 4: Distribution of Study Participants Based on Attitude Regarding Tobacco Exposure [*n*=176]

Item no.	Questions	Agree *n* (%)	Neutral *n* (%)	Disagree *n* (%)
1	It is acceptable to use tobacco/smoke in front of family members	12 [6.8]	12 [6.8]	152 [86.4]
2	It is acceptable to use tobacco/smoke in front of children	4 [2.3]	9 [5.1]	163 [92.6]
3*	Extensive campaign is needed against tobacco use	43 [24.4]	99 [56.3]	34 [19.3]
4*	Religion views smoking/tobacco use as bad	33 [18.8]	121 [68.8]	22 [12.4]
5	A person looks smart when he smokes.	6 [3.4]	82 [29.5]	88 [50]

*Reversely scored

Table 5: Univariate and Multivariable Logistic Regression Models of Tobacco Use, SHS Exposure and High Tobacco Exposure [*n*=176]

Category	Model 1 Tobacco Use			Model 2 SHS Exposure			Model 3 High Tobacco Exposure		
	Present number (%)	OR [95%CI]	AOR [95%CI]	Present number (%)	OR [95%CI]	AOR [95%CI]	Present number (%)	OR [95%CI]	AOR [95%CI]
KNOWLEDGE									
Unsatisfactory	46 [49.5]	2.21	1.22	86 [74.8]	1.25	1.16	66 [57.4]	1.56	1.31
Satisfactory (*r*)	14 [21.2]	[1.10-4.53]	[1.06-2.76]	21 [42.6]	[1.01-3.32]	[1.01-2.54]	25 [41]	[1.11-3.36]	[1.03-3.29]
ATTITUDE									
Unfavourable	48 [41.6]	2.86	1.96	76 [74.8]	2.31	1.93	64 [59.3]	2.11	1.73
Favourable (*r*)	12 [20.6]	[1.48-5.82]	[0.90-4.28]	35 [51.5]	[1.01-4.47]	[1.17-4.52]	27 [39.7]	[1.12-2.37]	[0.88-3.96]
AGE									
>49 years	28 [44.4]	0.78	-	51[81]	1.61	-	47 [74.6]	4.61	3.82
≤49 years (*r*)	32 [28.3]	[0.32-1.18]		80 [70.8]	[1.32-2.29]		44 [38.9]	[2.32-9.19]	[1.92-7.87]
OCCUPATION									
Work for pay	29 [25.9]	2.79	2.13	48[65]	1.26	-	35 [54.7]	1.21	-
Others (*r*)	41 [68.9]	[1.43-6.12]	[1.21-4.53]	83 [74.1]	[0.72-1.89]		56 [50]	[0.65-2.23]	
EDUCATION									
Up to primary	9[17]	3.52	2.12	90 [73.2]	1.89	1.96	70 [56.9]	2.01	1.74
Above primary (*r*)	51[43.5]	[1.62-7.77]	[1.45-5.42]	41 [32.4]	[1.31-1.99]	[1.59-2.47]	21 [18.6]	[1.04-2.87]	[1.01-3.86]

r=reference population. Model fitting is good (Hosmer Lemeshow test *P* value for Model 1, 2, 3 were 0.680, 0.072 and 0.396 respectively). Nagelkerke and Cox and Snell *R²* for Model 1 were 0.242 and 0.228. Nagelkerke and Cox and Snell *R²* for Model 2 were 0.179 and 0.134. Nagelkerke and Cox and Snell *R²* for Model 3 were 0.183 and 0.137

knowledge. Similarly, those women with unfavorable attitude had 1.96 times greater odds for SHS exposure than with the favorable attitude. It was a good fit model as evident from Hosmer-Lemeshow test (p = 0.072). The value of Nagelkerke R^2 and Cox and Snell R^2 showed that the variables in the model, predicted variance of SHS exposure score 17.9% and 13.4%, respectively [Table 5].

Predictors of high tobacco exposure

Significant factors associated with high tobacco exposure on univariate logistic regression analysis were respondents' age, education, knowledge, and attitude. On Multivariable regression, age more than 49 years, primary and below education and knowledge of the respondents retained their significance. Multivariable model was of good fit (Hosmer-Lemeshow test, *P* value < 0.05). The value of Nagelkerke R^2 and Cox and Snell R^2 showed that the independent variables in the model, predicted variance of high TES 18.3% and 13.7%, respectively [Table 5].

Discussion

Tobacco use

According to this study, the overall of tobacco use (smoke or smokeless form) among women was 34.1% which was higher than national (0.6%) and West Bengal (17.9%) data of GATS-2 India Survey 2016–2017 (0.6%).[3] According to NFHS-4 data, percentage of rural women who use any kind of tobacco in West Bengal is 9.3% which is much less than the current study findings.[16]

However our finding was less as compared to study by Tiwari R. *et al.* in Chhattisgarh.[17] Other studies in Haryana by Gupta *et al.* and in rural Bihar by Sinha *et al.* revealed that proportion of tobacco consumption in rural women was 17.7% and 21.7%, respectively, which was lower than our study finding.[18,19]

Smokeless form of tobacco use (34.1%) in current study was also higher than GATS-2 findings in rural women of West Bengal (17.2%) and India (14.3%).[3] Yuvaraj *et al.* in Karnataka revealed that 17.8% women consumed SLT.[20] However using GATS 1 data, Kaur *et al.* found high SLT usage pattern among rural women which was in conjunct with the current study.[11] Similar prevalence was also noted by Dasgupta *et al.* in a slum of Kolkata.[21]

Geographical variation and local customs and culture might be the reason for these variations.

Our study showed early initiation of tobacco habit during adolescent period, similar to a cross-sectional study in rural Nepal by Khatri *et al.*[22] This finding focuses on very important health education gap among adolescent females regarding tobacco hazards. Early initiation of tobacco may increase the risk of reproductive health of women and make them more susceptible to various cancers.

Only 1.1% of women were smokers similar to both national (2%) and West Bengal (0.9%) data of GATS-2 survey.[3] Lower proportion of smoking may be attributed to social values against smoking especially in rural women. Even the current study showed majority of the participants denounced of smoking in front of family members and children which in turn supports this hypothesis. Similar to a study in Delhi, our study findings also prove that women prefer bidi more than cigarettes.[23]

Predictors of tobacco use

In this study, overall tobacco use was found significantly associated with poor education which was similar to study by Yuvaraj *et al.* in Karnataka, Kahar *et al.* in rural Gujrat and national household cross-sectional survey.[20,24,25] Similar association also found in studies by Kaur *et al.* and Gupta *et al.*[11,18] In conjunct to past literature, recent study showed that economically independent women are more vulnerable to tobacco consumption.[11,20,24] Similar to Kahar *et al.*, our study also found significant association between unsatisfactory knowledge and tobacco use.[24] However, no significant association between age and tobacco usage was noted dissimilar to the previous studies.[11,20,24-26]

Second-hand smoke (SHS) exposure at home

Nearly three fourth of rural women were exposed to SHS exposure at home which is much higher than the national prevalence (39.3%) and prevalence of West Bengal (56.8%) according to GATS-2 survey.[3] Abdullah *et al.* found that 47.7% of rural women in Bangladesh were exposed to SHS at home.[9] Similar finding (51.1%) was found by Wang *et al.* in six counties of China.[27] Higher SHS exposure despite the denial of acceptability of smoking in front of family members especially children clearly indicates the gender inequalities in decision making regarding health issues among rural women.

A secondary data analysis by Reddy *et al.* showed that exposure of second hand smoke among women was higher at house in rural area including youths.[28] Another cross-sectional study in Punjab by Bhatt *et al.*,[29] found that women in rural areas were more exposed to SHS at home as compared to men. Rural women are more susceptible and hence more prone to hazards due to SHS at home.

Predictors of second-hand smoke (SHS) exposure at home

Similar to Wang *et al.* and Singh *et al.* our study also demonstrated significant association of SHS exposure and unsatisfactory knowledge.[14,27] However current study did not found education as a predictor of SHS exposure. Irrespective of their educational attainment, majority were exposed to SHS (74.4%) which indicates lack of awareness messages regarding harms of tobacco use in educational curriculum. Intensive social and behavioral change communication (SBCC) campaigns are highly needed in this area.

Rising trends of various morbidities related to long-term tobacco exposure is a challenge to primary health care. Family physicians often encounter such problems in day to day practice.

Moreover SHS exposure is usually underreported and there is no risk-free margin for SHS exposure.[30] Government of India envisaged the menace of tobacco epidemic and launched various service packages under National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) and National Tobacco Control Programme (NTCP). Further strengthening of service delivery system is ensured through comprehensive primary health care approach via health and wellness centers under Ayushmann Bharat.[31] However it is evident that existing IEC activities as per those programs has reduced impact especially among these rural women. Thus, it is very important for primary care physicians to address this issue through successful community mobilization towards prevention of tobacco exposure along with promotion of smoke-free home which will contribute largely to the mitigation of all diseases associated with tobacco.

Being a community-based study, current study surmised that a clearer picture of tobacco exposure could be depicted. Magnitude of overall tobacco exposure was measured by TES including both tobacco use and second-hand smoke exposure at home.

The cross-sectional design was one of the main limitation of this study which hindered the researchers to make causal inferences from the associations analyzed. Self-reported data of tobacco exposure had a chance of recall and social desirability bias. Biochemical monitoring of tobacco exposure like nicotine concentration in blood was not conducted due to resource constraints.

Conclusion

Present study revealed that prevalence of SLT use as well as exposure of women to SHS at home was unexpectedly high. Most of the SLT users initiated tobacco in adolescent age and bought tobacco themselves. The associated factors of tobacco exposure found in this study may be taken into consideration to address tobacco menace among women.

Government of India should focus on women-oriented strategies under NTCP which includes year round SBCC campaigning regarding tobacco consumption especially SLT and SHS exposure at home, through existing primary health care infrastructure. Intensified health education programs including hazards to SHS exposure along with tobacco use should be considered for adolescents as well as adult males.

Consumption of SLT initiates the expectoration of spittle which is not only socially repugnant but is medically extremely detrimental and awareness campaign followed by effective policing can play a very important role in decimating this habit.

Conflicts of interest

There is no conflict of interest

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