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Urban–rural differentials in the factors associated with exposure to second-hand smoke in India

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ABSTRACT

Abstract: Objectives: This study aims to investigate the role of different factors associated with exposure to second-hand smoke (SHS) in the workplace and home in the urban and rural areas of India.

Design: Secondary analysis of the data from the Global Adult Tobacco Survey conducted in 2009–2010.

Setting and participants: Data were analysed from 32 738 rural and 23 202 urban non-smokers at home and 4809 rural and 6227 urban non-smokers in the workplace in India.

Outcomes and methods: We used two measures of SHS: exposure to SHS at home and exposure to SHS in the workplace. SHS exposure at home is estimated for non-smokers who reported anyone smoking inside his/her home. Exposure to SHS in the workplace is estimated for non-smokers who reported anyone smoking in the workplace in the past 30 days before the survey. Statistical techniques such as χ^2 test, logistic regression and discriminant function analysis were used.

Results: The results showed that SHS exposure in the workplace and home is higher in the rural areas than in the urban areas. As compared with men, women are significantly more likely to be exposed to SHS at home (OR=1.20, 95% CI 1.10 to 1.30) in the rural areas, and less likely at the workplace in the urban areas (OR=0.49, 95% CI 0.40 to 0.59). Education and region are significant predictors of exposure levels to SHS at home and the workplace in the rural and urban areas. The knowledge of number of smoking-related hazards significantly discriminates the SHS exposure in the rural workplace. SHS exposure at home is most affected by region in the rural areas and education in the urban areas.

Conclusions: The factors which affect SHS exposure differ in the rural and urban areas of India. The study concludes that the risk of getting exposed to SHS at home and the workplace among non-smokers is higher in the rural areas of the country.

Strengths and limitations of this study

- This study is the first of its kind which has comprehensively studied the factors of second-hand tobacco smoke (SHS) exposure in India by place of residence using large scale Global Adult Tobacco Survey (GATS) data.
- In the GATS survey, exposure to SHS questions were directly asked to the respondents and some bias might be present in the reporting of SHS exposure at home and workplace.
- The reporting of SHS exposure among retired or unemployed people might be related to their earlier work experience. These cases are included in the GATS analysis and report; therefore, we used these cases in the analysis of SHS exposure in the workplace.

INTRODUCTION

Second-hand tobacco smoke (SHS) is formed from the burning of smoking products and the smoke exhaled by the smokers.[1] Worldwide, a large proportion of children, male and female non-smokers are exposed to the second-hand smoke at home. Exposure to second-hand smoke resulted in the occurrence of several diseases such as ischaemic heart disease, lower respiratory infections, asthma and lung cancer, and even death.[2 3] With the growing scientific evidences for the hazard of SHS, many countries have taken stringent action to reduce SHS exposure through legislation and health education, and have achieved significant improvements.[4]

Smoke-free laws are essential to check exposure to SHS. WHO Framework Convention for Tobacco Control has incorporated smoke-free laws as an effective global tobacco control policy.[5] The Government of India enacted 'Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003 (COTPA)' to prohibit the consumption of cigarettes and other tobacco products, which are injurious to health in order to improve public health, prohibit the advertisement and provide for regulation of trade, commerce, production, supply and distribution of cigarettes and other tobacco products in the country. Various provisions of this Act

have been enforced since 1 May 2004. The key features of the COTPA include a ban on smoking in public places, including indoor workplaces, ban on advertisement, promotion of tobacco products displaying health warning on tobacco products and testing of tobacco products. The smoke-free rules were revised in October, 2008, redefining 'public places' to include all the workplaces. These rules authorised specific personnel responsible for enforcement of law for maintaining smoke-free public places countrywide.[6] Prohibition of smoking in public places is imposed, and fine is collected from violators. In spite of a comprehensive legislation being in place and implementation of National Tobacco Control Programme (NTCP) by the Government, effective measures for tobacco control are still lacking in many states. The internal monitoring of implementation of COTPA in 21 states under implementation of NTCP has revealed that only half of the states have mechanisms for monitoring provisions under the law. Although 15 states have established the mechanism for enforcement of smoke-free rules, 11 states collected fines for violations of bans on smoking in public places.[7]

Workplace and home are the most common places for SHS exposure. Recent tobacco-based survey in India such as Global Youth Tobacco Survey (GYTS) collected information on exposure to SHS among school children aged 13–15 years. GYTS reported that the children are at higher risk of being exposed to SHS in India and half of the students are exposed to SHS.[8] Global Adult Tobacco Survey (GATS) conducted in 2009–2010 in India reported that 26% and 57% of non-smokers are exposed to SHS in the workplace and home, respectively.[6] The risk of SHS exposure among non-smokers in India is relatively high. Furthermore, India is the second largest consumer of tobacco products and third largest producer of tobacco in the world.[6]

Earlier studies on SHS in India were often constrained due to a lack of large-scale survey data on tobacco use and exposure to SHS. Recently conducted GATS in 2009–2010 is the first nationwide tobacco survey on adults which collected data on SHS exposure with various socioeconomic and demographic characteristics.[6] These data have an ample scope to study the SHS exposure and its associated factors. GATS is the first large-scale survey conducted after the enactment of the COTPA act to check the SHS exposure. Most of the past studies on tobacco are based on either localised studies with an urban bias or non-representative sample surveys with sociodemographic predictors of tobacco-related behaviour being poorly understood.[9]

Several studies in India show significant urban–rural differentials in mortality, and health-related behaviour.[9 10] Differences are furthermore noticed in the consumption behaviour and attitude towards smoking.[6] Studies also reported urban–rural difference in knowledge, type of health hazard and intentions to quit smoking.[10–14] Exposure to SHS is one of the major concerns in India where 14% of the adult population is smoking, and the prevalence in the rural areas is higher than in the urban areas.[6] In the above context, this study examines the factors associated with exposure to the second-hand smoke among adult non-smokers in India separately for the rural and urban residence.

METHODS

Data source

GATS is conducted in India in 2009–2010 to monitor adult tobacco use (smoking and smokeless) and the key tobacco control indicators. GATS-India is a nationally representative household survey including household population of age 15 and above and covering 29 states and two Union Territories in India. Multistage-sampling procedure was adopted independently in each state and within the state, independently in the urban and rural areas to select the sample. In the urban areas, three-stage sampling was adopted for the selection of households. At the first stage, the list of wards from all cities and towns of the state/UT formed the urban sampling frame from which a required sample of wards, that is, primary sampling units (PSUs), was selected using probability proportional to size (PPS) sampling. At the second stage, a list of census enumeration blocks (CEBs) in every selected ward formed the sampling frame from which one CEB was selected by PPS from each selected ward. At the third stage, a list of all the residential households in each selected CEB formed the sampling frame from which a sample of the required number of households was selected. In the rural areas, two-stage sampling was adopted for the selection of households. The PSUs were villages selected using PPS sampling method. At the second stage, a list of all the residential households in each selected village formed the sampling frame from which a sample of the required number of households was selected. Complete data for 69 296 respondents are available among which 33 767 and 35 529 were men and women, respectively. Survey domains include tobacco use (smoking and smokeless tobacco), exposure to second-hand smoke, cessation, the economics of tobacco, exposure to media messages on tobacco use and knowledge, attitudes and perceptions towards tobacco use.[6]

Measures

Exposure to the second-hand smoke at home is estimated for non-smokers who reported anyone smoking inside his/her home (daily, weekly or monthly). Exposure to second-hand smoke at the workplace is estimated for non-smokers who reported anyone smoking in the workplace in the past 30 days before the survey. The workplace includes indoors or both indoors or outdoors areas.

Statistical analysis

Bivariate and multivariate logistic regression analysis was applied to examine the sociodemographic factors

associated with the exposure to SHS. Exposure to the second-hand smoke at home and the workplace is our major dependant variable.

The independent variables used in the bivariate and logistic regression analysis are age (3 categories), sex (male/female), education (4 categories), occupation (5 categories), region, exposure to antismoking messages in the newspaper or magazines, TV/radio in the past 30 days before the survey, knowledge that exposure to SHS causes serious illness, knowledge that exposure to smoking causes heart attack, stroke and lung cancer. Exposure to antismoking messages and knowledge-related variables are used in dichotomous form (yes/no). Region in the analysis includes six geographical regions covering 29 states and two union territories. The north includes Jammu and Kashmir, Himachal Pradesh, Punjab, Chandigarh, Uttarakhand, Haryana and Delhi; central includes Rajasthan, Uttar Pradesh, Chhattisgarh and Madhya Pradesh; east includes West Bengal, Jharkhand, Odisha and Bihar; northeast includes Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and Assam; west includes Gujarat, Maharashtra and Goa; south includes Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Puducherry.

Discriminant analysis was applied to analyse the factors discriminating the SHS exposure group to the non-exposure group. For the discriminant analysis, the dependent variable should be categorical and the independent variable should be either dichotomous or continuous. Age and education in single year was used in this analysis. Occupation was categorised into 'government, non-government employee' and 'others'; region into 'north' and 'other' and antismoking messages exposure variables as 'Yes' and 'No'. The knowledge of number of smoking health hazard was computed using four variables which include knowledge of SHS health hazard, knowledge of smoking cause's stroke, heart attack and lung cancer. The values of this variable range from 0 to 4, where '0' signifies that the person has no knowledge of any smoking health hazard and '4' signifies that the person is aware about all four smoking health hazards.

RESULTS

Exposure to SHS in the workplace

Among the 4809 rural non-smoker respondents, 27.8% were exposed to SHS at the workplace and 24.3% among 6227 urban respondents (table 1). In the urban workplace, significant male–female difference in SHS exposure was observed (χ^2 value=56.684, p<0.01). Exposure to SHS does not show any apparent pattern with age. The higher exposure to SHS at the workplace is reported by uneducated adults than the educated adults. (rural: χ^2 value=69.489, p<0.01; urban: χ^2 value=92.792, p<0.01). Urban non-smokers in the northeast had a higher prevalence of SHS in the workplace while in the rural areas non-smokers from the East region had the highest prevalence. The rural non-

Table 1 Weighted prevalence of exposure to SHS at the workplace among non-smokers by place of residence and background characteristics

	Rural (N=4809)	Urban (N=6227)
Overall	27.8	24.3
Sex		
Male	28.4	27.7
Female	25.7	11.6
χ^2 value	0.13	56.684**
Age group		
15–24	25.9	25.3
25–44	29.4	24.6
45–64	26.3	22.5
65+	28.6	25.8
χ^2 value	0.81	4.457
Education		
No formal education	37.6	30.5
Less than primary	33.2	34.5
Primary but less than secondary	32.2	28.2
Secondary and above	20.4	21.1
χ^2 value	69.489**	92.792**
Occupation		
Government and non-government employee	25.1	21.9
Self-employed	32.4	29.2
Student	13.6	14.1
Homemaker	35.2	23.1
Retired or unemployed	49.7	39.5
χ^2 value	116.374**	65.439**
National region		
North	25.9	14.7
Central	23.7	28.6
East	31.9	27.0
Northeast	30.1	31.1
West	29.3	21.8
South	27.9	24.9
χ^2 value	31.587**	168.729**
Antismoking messages in newspaper or magazines		
No	25.4	22.8
Yes	26.7	24.5
χ^2 value	1.746	4.116*
Antismoking messages in TV/radio		
No	25.9	26.9
Yes	29.0	23.7
χ^2 value	2.467	3.668
Knowledge that SHS exposure is harmful		
No	33.6	28.6
Yes	27.2	24
χ^2 value	6.157*	3.031
Knowledge that smoking causes stroke		
No	32.7	24.9
Yes	24.2	23.9
χ^2 value	24.662**	6.274*
Knowledge that smoking causes heart attack		
No	35.2	28.6
Yes	25.0	23.1
χ^2 value	41.497**	11.324**
Knowledge that smoking causes lung cancer		
No	40.3	27
Yes	26.6	24.1
χ^2 value	16.403**	0.02

*p<0.05.
**p<0.01.
SHS, second-hand tobacco smoke.

smokers who had the knowledge of smoking-related illness reported lower SHS exposure in the workplace. Prevalence of SHS is lower among the non-smokers who are aware of the harmful effect of smoking and SHS-related illness. The difference in SHS exposure by knowledge of tobacco health hazard is higher in the rural areas than in the urban areas. In the urban areas, noticing antismoking messages in TV/radio is negatively associated with exposure to SHS.

Exposure to SHS at home

Among the 32 738 rural smokers and 23 202 urban non-smokers, 53.7% and 34.5% were exposed to SHS at home, respectively (table 2). Contrary to the workplace, female non-smokers reported higher exposure to SHS at home and the χ^2 test shows a significant association at p<0.01. Younger adults reported higher exposure to SHS than older adults. Age is significantly associated with SHS exposure at home (rural: χ^2 value=57.391, p<0.01; urban: χ^2 value=112.122, p<0.01). Secondary and above educated, government and non-government employee and South region non-smokers had lower exposure to SHS in the urban and rural areas. The non-smokers with the knowledge of smoking-related illness and exposure to antismoking messages in newspaper and TV/radio had the lowest reported exposure to SHS at home in the rural and urban areas. Contrary to the workplace, the gap in SHS exposure by knowledge status is higher in the urban areas and lower in the rural areas at home.

Analysis of factors correlated with second-hand smoke exposure at the workplace

As shown in table 3, non-smoking elderly aged 65 and above at the workplace in the rural areas (OR 0.44, 95% CI 0.24 to 0.79) and non-smokers in the age 45–64 in the urban areas (OR 0.72, 95% CI 0.56 to 0.92) were significantly less likely to be exposed to SHS. The 'more than primary educated' non-smokers in the rural areas are less likely to be exposed compared with the illiterate (more than primary: OR 0.62, 95% CI 0.47 to 0.83; secondary and above: OR 0.51, 95% CI 0.38 to 0.68). In the urban areas secondary and above educated non-smokers (OR 0.58, 95% CI 0.40 to 0.84) are less likely to get exposed to SHS. Self employees have higher odds of getting exposed to SHS at the workplace in the rural and urban areas. In the rural areas, Western region non-smokers are significantly less likely to be exposed to SHS at the workplace. In the urban workplace, compared with north, the non-smokers in all other regions are more likely to be exposed and in the northeast region the odds are four times higher. Knowledge of heart attack and exposure to TV/radio messages is significantly associated with SHS exposure in the rural and urban areas. The non-smokers who are aware of smoking causation with heart attack are 20% less likely to be exposed to SHS in the workplace than those who do not have such knowledge. All the other knowledge-related variables are insignificant.

Table 2 Weighted prevalence of exposure to SHS at home among non-smokers by place of residence and background characteristics

	Rural (N=32 738)	Urban (N=23 202)
Overall	53.7	34.5
Sex		
Male	49.2	32.2
Female	57.4	36.6
χ^2 value	207.905**	113.943**
Age group		
15–24	55.6	38.7
25–44	53.9	34.4
45–64	51.1	29.9
65+	50.7	31.0
χ^2 value	57.391**	112.122**
Education		
No formal education	60.6	47.6
Less than primary	53.6	41.9
Primary but less than secondary	54.3	39.4
Secondary and above	41.8	25.5
χ^2 value	485.83**	805.538**
Occupation		
Government and non-government employee	49.9	31
Self-employed	53.9	37.1
Student	51.1	30.9
Homemaker	57.2	37.3
Retired or unemployed	52.2	30.2
χ^2 value	139.969**	139.226**
National region		
North	52.9	38.9
Central	67.1	48.7
East	58.8	44.2
Northeast	52.6	44.6
West	46.6	32.9
South	29.2	17.8
χ^2 value	2630.923**	1654.412**
Antismoking messages in newspaper or magazines		
No	50.3	35.7
Yes	42.9	28.0
χ^2 value	128.537**	123.547**
Antismoking messages in TV/radio		
No	50.4	36.6
Yes	48.9	31.6
χ^2 value	6.117*	44.941**
Knowledge that SHS exposure is harmful		
No	56.1	39.8
Yes	53.2	33.9
χ^2 value	10.528**	20.242**
Knowledge that smoking causes stroke		
No	55.5	35.6
Yes	51.8	33.6
χ^2 value	30.509**	22.938**
Knowledge that smoking causes heart attack		
No	56.4	39.5
Yes	52.1	32.6
χ^2 value	25.753**	56.260**
Knowledge that smoking causes lung cancer		
No	57.7	41.5
Yes	52.9	33.8
χ^2 value	1.441	36.311**

*p<0.05.
**p<0.01.
SHS, second-hand tobacco smoke.

Table 3 Result of logistic regression analysis of exposure to SHS in the workplace by place of residence

	Rural OR (95% CI)	Urban OR (95% CI)
Sex		
Male	1.00	1.00
Female	0.92 (0.76 to 1.11)	0.49 (0.40 to 0.59)
Age group		
15–24	1.00	1.00
25–44	0.87 (0.70 to 1.08)	0.91 (0.73 to 1.13)
45–64	0.85 (0.66 to 1.11)	0.72 (0.56 to 0.92)
65+	0.44 (0.24 to 0.79)	0.92 (0.57 to 1.49)
Education		
No formal education	1.00	1.00
Less than primary	0.87 (0.62 to 1.24)	0.99 (0.62 to 1.57)
Primary but less than secondary	0.62 (0.47 to 0.83)	0.94 (0.64 to 1.37)
Secondary and above	0.51 (0.38 to 0.68)	0.58 (0.40 to 0.84)
Occupation		
Government and non-government employee	1.00	1.00
Self-employed	1.76 (1.49 to 2.08)	1.35 (1.16 to 1.56)
Student	0.95 (0.66 to 1.38)	0.79 (0.51 to 1.23)
Homemaker	1.42 (1.00 to 2.03)	1.17 (0.64 to 2.15)
Retired or unemployed	1.81 (1.12 to 2.93)	1.50 (0.87 to 2.59)
National region		
North	1.00	1.00
Central	1.05 (0.75 to 1.50)	2.08 (1.62 to 2.67)
East	0.80 (0.59 to 1.10)	2.11 (1.63 to 2.73)
Northeast	1.20 (0.98 to 1.47)	4.04 (3.19 to 5.10)
West	0.64 (0.49 to 0.84)	1.34 (1.08 to 1.66)
South	0.83 (0.65 to 1.07)	1.87 (1.52 to 2.30)
Antismoking messages in newspaper or magazines		
No	1.00	1.00
Yes	1.11 (0.93 to 1.32)	1.03 (0.87 to 1.22)
Antismoking messages in TV/radio		
No	1.00	1.00
Yes	1.30 (1.08 to 1.57)	1.15 (0.95 to 1.38)
Knowledge that SHS exposure is harmful		
No	1.00	1.00
Yes	0.97 (0.73 to 1.28)	1.08 (0.80 to 1.47)
Knowledge that smoking causes stroke		
No	1.00	1.00
Yes	1.03 (0.85 to 1.25)	1.03 (0.87 to 1.23)
Knowledge that smoking causes heart attack		
No	1.00	1.00
Yes	0.60 (0.49 to 0.75)	0.80 (0.65 to 0.98)
Knowledge that smoking causes lung cancer		
No	1.00	1.00
Yes	1.08 (0.80 to 1.47)	1.19 (0.84 to 1.68)

SHS, second-hand tobacco smoke.

Table 4 Result of logistic regression analysis of exposure to SHS at home by place of residence

	Rural OR (95% CI)	Urban OR (95% CI)
Sex		
Male	1.00	1.00
Female	1.20 (1.10 to 1.30)	1.09 (0.99 to 1.20)
Age group		
15–24	1.00	1.00
25–44	0.91 (0.84 to 1.00)	0.76 (0.68 to 0.84)
45–64	0.74 (0.66 to 0.82)	0.54 (0.47 to 0.60)
65+	0.55 (0.47 to 0.65)	0.48 (0.39 to 0.58)
Education		
No formal education	1.00	1.00
Less than primary	0.97 (0.87 to 1.09)	0.81 (0.69 to 0.95)
Primary but less than secondary	0.80 (0.73 to 0.88)	0.67 (0.59 to 0.76)
Secondary and above	0.49 (0.44 to 0.54)	0.34 (0.30 to 0.39)
Occupation		
Government and non-government employee	1.00	1.00
Self-employed	1.12 (1.02 to 1.23)	1.22 (1.10 to 1.35)
Student	1.20 (1.05 to 1.36)	0.81 (0.70 to 0.94)
Homemaker	0.99 (0.89 to 1.09)	1.05 (0.94 to 1.18)
Retired or unemployed	1.17 (1.00 to 1.37)	1.15 (0.96 to 1.38)
National region		
North	1.00	1.00
Central	0.75 (0.66 to 0.85)	1.07 (0.96 to 1.20)
East	0.45 (0.41 to 0.51)	0.88 (0.79 to 0.99)
Northeast	0.52 (0.48 to 0.56)	1.55 (1.39 to 1.74)
West	0.31 (0.28 to 0.34)	0.54 (0.49 to 0.60)
South	0.11 (0.10 to 0.12)	0.18 (0.16 to 0.20)
Antismoking messages in newspaper or magazines		
No	1.00	1.00
Yes	0.87 (0.81 to 0.94)	0.85 (0.78 to 0.92)
Antismoking messages in TV/radio		
No	1.00	1.00
Yes	1.02 (0.95 to 1.09)	0.99 (0.91 to 1.08)
Knowledge that SHS exposure is harmful		
No	1.00	1.00
Yes	0.92 (0.84 to 1.01)	1.05 (0.93 to 1.19)
Knowledge that smoking causes stroke		
No	1.00	1.00
Yes	0.89 (0.83 to 0.96)	0.91 (0.84 to 0.99)
Knowledge that smoking causes heart attack		
No	1.00	1.00
Yes	1.06 (0.98 to 1.15)	1.15 (1.04 to 1.28)
Knowledge that smoking causes lung cancer		
No	1.00	1.00
Yes	1.14 (1.02 to 1.27)	0.97 (0.84 to 1.12)

SHS, second-hand tobacco smoke.

Analysis of factors correlated with second-hand smoke exposure at home

Women are significantly (OR 1.20, 95% CI 1.10 to 1.30) more likely to be exposed to SHS at home in the rural areas and not in the urban areas (table 4). The non-smokers with more than a primary education are significantly less likely to be exposed to SHS in the rural areas. In the urban areas, compared with the illiterate the educated non-smokers are less likely to be exposed to SHS at home. Age is a significant factor affecting the exposure to SHS at home in the rural and urban areas. Higher age non-smokers are significantly less likely to be

exposed to SHS compared with younger adults. Self employees in the rural and urban areas are more likely to be exposed to SHS. Students are significantly less likely to be exposed in the urban areas and more likely in the rural areas. In the rural areas, compared with the northern region all other regions have significantly lower odds of being exposed. In the urban areas north-east and central region non-smokers have higher odds of being exposed (OR 1.55, 95% CI 1.39 to 1.74; OR 1.07, 95% CI 0.96 to 1.20). The non-smokers with exposure to antismoking message in the newspaper and magazines are significantly less likely to be exposed by 13% in the rural areas and 15% in the urban areas. The knowledge of smoking causes stroke and lung cancer is significantly associated with SHS exposure in the rural areas. The knowledge of stroke and heart attack is significantly associated with SHS exposure in the urban areas.

Discriminant function analysis of SHS exposure

Discriminant function analysis classified the non-smokers by SHS exposure in the workplace and home. Structure correlation matrix of the discriminant function shows that education (0.703), occupation (−0.695) and knowledge of number of smoking-related hazards (0.478) added most to discriminate in the rural workplace. Region (−0.610), occupation (−0.480) and sex of the respondent (0.445) add large absolute correlation in the urban areas. In the rural areas, region (0.701) followed by education (0.490) and antismoking message exposure in newspapers or magazines (0.322) discriminates the SHS exposure at home. Education (0.780), age (0.312) and occupation (−0.305) add most to the discrimination in the urban areas at home (table 5).

Table 5 Structural correlation coefficients of discriminant function analysis

	Rural	Urban	Rural	Urban
	Exposure to SHS in the workplace		Exposure to SHS at home	
Sex	0.072	0.445	−0.266	−0.228
Age	−0.007	0.118	0.218	0.312
Education	0.703	0.623	0.490	0.780
Occupation	−0.695	−0.480	−0.296	−0.305
Region	−0.032	−0.610	0.701	0.291
Antismoking in newspaper	0.130	0.129	0.322	0.376
Antismoking in TV/radio	−0.058	0.111	0.144	0.239
Number of smoking hazard	0.478	0.156	0.030	0.117

SHS, second-hand tobacco smoke.

DISCUSSION AND CONCLUSION

This study comprehensively investigates the factors associated with exposure to SHS in India by place of residence. Since the enactment of the COTPA act in 2003 in India, there is a prohibition on smoking in public places and prescribes physical segregation of smoking and non-smoking area.[6] Higher proportion of non-smokers are exposed to SHS in the rural workplace than in the urban workplace. The exposure to SHS in the workplace among men is high in the urban areas. Higher risk of SHS exposure among women at home is consistent with the other studies findings. Higher smoking prevalence among men is often linked to higher levels of SHS exposure among non-smoking women and children's living in the smoker's household.[15] In India SHS risk among women is much higher in the rural areas. Although the level of awareness of SHS health hazard is substantial among female non-smokers in India,[6] this knowledge do not lead to avoidance of SHS exposure. Women in the workplace are significantly less likely to be exposed to SHS compared with their male counterparts suggesting that the risk of SHS exposure among women is a major concern at home. With the increase in education, non-smokers are less likely to be exposed to SHS at home and workplace in the urban and rural areas. Consistent with previous studies,[16] this study also shows that education is the most significant predictor of exposure to SHS. Effect of higher education on SHS exposure suggests a minor role of education in the urban workplace. A large regional disparity in SHS exposure at home and the workplace is observed in India. In the urban areas, non-smokers for the regions other than north have a higher chance of being exposed in the workplace and lower chance in the rural areas at home. Moreover, there is a significant geographical variation in the consumption of smoking and smokeless tobacco as well as the type of tobacco products consumed, as described in other studies.[17] This possibly reflects the distinct regional, cultural, religious and social patterns about behaviours related to tobacco.[18]

Knowledge level had a significant effect on behaviour towards SHS exposure, as evident in other studies.[19] This study shows that the knowledge of different smoking-related and SHS-related illness do not necessitate into behaviour. A considerable proportion of people have the knowledge of tobacco health hazard, but there is a gap in the appropriate knowledge of the tobacco health hazard.[20] The discriminant analysis shows that the knowledge of number of tobacco-related illness contributes substantially in discriminating SHS exposure in the rural workplace. Therefore, there is a need to create awareness among people about the health hazard of tobacco and its several consequences. Since there is limited knowledge of smoking health hazard and SHS exposure.[4]

Other than the national level mass media campaign, the antitobacco TV/radio messages were translated into 18 languages for the national campaign to be more effective, keeping in mind the regional diversity of the country.[7] Expanding the coverage of tobacco control campaigns is important in reducing SHS exposure in

the rural areas. The reach of smoke-free laws is not noticeable in the rural areas. Proper counselling and increasing the awareness level of smokers about the harmful impact of SHS is necessary to protect the non-smokers. There is an urgent need for stricter implementation of smoke-free rules in the workplace as segregating the smoking and non-smoking areas may not help in reducing further SHS exposure among non-smokers. Beyond eliminating SHS exposure among non-smokers, smoking bans have added benefits, including reduced smoking intensity and potential cost savings to employers. Optimal protection of non-smokers and smokers requires a smoke-free environment.

Eminent knowledge of the effects of SHS is important as people are aware of the harmful effects of SHS exposure, but the extent of damage that SHS can make is unknown to people.[21] Furthermore, the knowledge of the harmful effect of SHS exposure should include the ill effect on pregnant women, fetal outcomes and the children at home. The results give further evidence to initiate specific interventions to reduce SHS exposure at home. Strict implementation of any rules and regulations at home is difficult to propose by any government. Over the past few years, initiation has been made to reduce smoking in the residential premises in countries like the USA. The housing units owned by private landlords are providing smoke-free housing units, and local governments have gone further, banning smoking in multifamily residential buildings.[22] These strategies can help out in reducing SHS exposure in the urban housing premises in India. However, differentials in the housing system may possibly restrict implementing these strategies in the rural India. Community-based interventions and incorporating local government and panchayats in promoting smoke-free environments can be more useful in the rural areas. Evidences from other countries suggest that the community-based interventions are reasonably effective in reducing SHS exposure. These interventions include a mixture of biochemical feedback, counselling and information provision.[23] In India, small-scale studies also reported that community-based interventions had increased the rates of tobacco cessation in the rural areas.[24 25] Considerable reductions in SHS exposure level can be achieved using these interventions in the rural India. Effective interventions are required to protect non-smokers from the harmful effect of SHS at home separately for the rural and the urban India. Although India has enacted tobacco control legislation and rules have been made to protect the non-smokers from SHS in public and workplaces, similar focus is also required to protect the non-smokers residing in homes.

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