RESEARCH PAPER

Exposure to domestic violence associated with adult smoking in India: a population based study

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Objective: To investigate the relation between domestic violence and tobacco use among adults in India.
Design: Multilevel cross sectional analyses of a nationally representative population based sample from the 1998–9 Indian national family health survey.
Participants: 278 977 individuals aged 15 or older; and 89 092 ever married women aged 15–49.
Main outcome: Dichotomous variables for smoking and chewing tobacco.
Results: Women who reported being abused more than one year ago and those who reported being abused in the past year were more likely to smoke and chew tobacco than women who have never experienced domestic violence. Compared to individuals who lived in homes where no abuse was reported, those who lived in homes where a woman reported experiencing domestic violence were more likely to smoke and chew tobacco.
Conclusion: Domestic violence is associated with higher odds of smoking and chewing tobacco in India. Efforts to control tobacco use need to consider the larger psychosocial circumstances within which individuals who practise such harmful health behaviours reside.

Tobacco use contributes to the deaths of at least 800 000 people in India every year.[1] While smoking is a well established practice among Indian men affecting 29.3% of adult males,[2] it is less so for women.[3] Although the overall prevalence of smoking among women is low, estimated to be 2.5%,[2] there is substantial heterogeneity within the country, with some states observing prevalence rates of up to 24%.[4] In addition, the prevalence and the absolute number of female smokers are also anticipated to increase as targeted marketing of cigarettes and social change accompanying rapid economic growth diminish the social norms that have traditionally discouraged smoking by Indian women.[1 5] Tobacco use in India is not restricted to smoking, with chewing tobacco representing another main source of tobacco use.[1] While there remain marked sex differentials in tobacco chewing,[3] the differentials are smaller than those observed for smoking, with current prevalence for tobacco chewing being estimated as 12.0% for women and 28.1% for men.[2] Although previous research has documented the socioeconomic and demographic patterning of tobacco use in India,[2 6–8] there has been little research of the potential psychosocial risk factors that are associated with tobacco use among Indians.

We investigate the relation between domestic violence (DV) and smoking and tobacco chewing in India. We conceptualise DV and exposure to household DV as markers for stressful psychosocial circumstances. Personal experiences of DV or exposure to DV within the home can be regarded as a critical source of psychosocial stress.[9 10] According to one estimate, some 40% of Indian women report being slapped, hit, kicked or beaten during their married life,[11] suggesting the widespread prevalence of this social risk factor to which women and their families are exposed. Studies conducted in the United States have shown positive associations between DV and smoking,[12–15] and between exposure to household DV and smoking.[16] Explanations to account for the association between DV and smoking tend to focus on smoking being a ''stress reliever,''[17] even though recent evidence on this is mixed.[18] It is however clear that, regardless of whether or not smoking reduces stress, smokers and potential smokers believe that it will.[19] Indeed, Indians who smoke and chew tobacco frequently identify stress relief as an important reason for initiating and continuing their tobacco use.[20 21] We examine the association between experience of DV and current smoking—a marker for psychosocial stress—and tobacco chewing among women, and between exposure to DV within the home and smoking and tobacco chewing among family members, after controlling for a range of demographic and socioeconomic characteristics.

METHODS

Data

The analyses used datasets derived from the second National Family Health Survey (NFHS-2), a nationally representative cross sectional survey administered in India during 1998–9.[4] An adult member of each sampled household answered questions about demographic and health information concerning every household member during in-person interviews with a response rate of 98%. Each household was linked in the data to the primary sampling unit, district, and state in which it was located. The primary sampling units (hereafter called neighbourhoods) were villages or village clusters in rural areas and census enumeration districts in urban areas. After the household members were identified, each ever married woman aged 15–49 in every sampled household answered questions regarding maternal and child health indicators in an in-person interview, achieving a 96% response rate. The first analytical sample includes the 89 092 women who answered the women's survey and provided complete information on DV victimisation, tobacco use and covariates. The second analytical sample includes the 278 977 family members of these women for whom complete information about tobacco use and covariates was obtained. These participants were sampled in 74 163 households in 3215 neighbourhoods in 440 districts in all 26 Indian states.

Abbreviations: DV, domestic violence; NFHS, National Family Health Survey

Outcomes

Tobacco smoking and chewing were conceptualised as interchangeable manifestations of a stressful social environment. These variables were measured from binary responses given during the household survey.

Exposure

Information regarding DV experience since age 15 recorded in the women's survey yielded a measure of DV recency with the following three categories: never abused, abused more than 12 months ago (past abuse), or abused in the previous 12 months (current abuse). This exposure was used to assess the relation between DV and smoking among the ever married women sample.

Each woman's DV report was additionally linked to her household to create a household DV exposure variable using the same categories. For those households in which more than one woman provided DV information, that of the woman reporting the most recent DV experience was used to represent the household exposure DV. This household variable was used as the exposure in models using the full sample of adult men and women.

Covariates

We considered a range of individual demographic, socioeconomic and behavioural covariates for these analyses (table 1). Responses to the household questionnaire provided information about the family's religion, caste[22] and standard of living.[23 24] Other covariates included age, sex, marital status, education, residential living environment, women's employment, pregnancy status and body mass index.

Ethical considerations

Details of this study were approved by the Harvard School of Public Health institutional review board human subjects committee.

Statistical analysis

We utilised a logistic multilevel modelling approach,[25 26] and the substantive and technical relevance of these models are well described elsewhere.[27–29] We modelled the likelihood of being a tobacco smoker or chewer given the fixed effects of own or household abuse reports and the random effects associated with states, districts, neighbourhoods and households. All models were estimated with the quasi-likelihood approximation with first order Taylor linearisation procedure.[25]

RESULTS

In the ever married women's sample, 19% of the women reported experiences of abuse with 85% of abused woman reporting abuse by their husband. Substantial associations were found between smoking and past abuse (odds ratio (OR) 1.27, 95% confidence interval CI) 1.10 to 1.46) or current abuse (OR 1.35, 95% CI 1.17 to 1.55) compared to those reporting no abuse (fig 1). The results in the full sample also indicated a positive association between smoking and living in a household where women reported past abuse (OR 1.27, 95% CI 1.10 to 1.46) or current abuse (OR 1.35, 95% CI 1.17 to 1.55) compared to those living in households where women reported no DV. The association between tobacco chewing and DV in both the woman's sample and the full sample were approximately equivalent to the analogous associations with smoking.

We performed several sensitivity analyses to confirm the observed findings. We additionally tested for two and three way interactions between DV and age/SLI/education/caste, and did not observe the interactions to be substantial (results not shown). We also investigated the impact of DV perpetrated by male and female relatives separately in the women's sample and found increased smoking (OR 1.30, 95% CI 1.17 to 1.46) and chewing (OR 1.36, 95% CI 1.28 to 1.44) for those abused by male relatives but not for female relatives (OR 1.07, 95% CI 0.84 to 1.36; OR 1.10, 95% CI 0.97 to 1.26). We further analysed the full sample stratified by age and observed significant associations between smoking/tobacco chewing and DV across all age strata. In additional tests that pertained to specifying fixed effects for the different states, we found that the relation observed between smoking/tobacco chewing and DV did not change, both for the full as well as the ever married women sample. We also re-estimated the full sample models by excluding women who had been abused and did not find any change in the reported association between smoking or chewing and DV (results not shown). There was some attenuation when abused women and their abusive husbands were removed from the analyses simultaneously, but a substantial association remained between smoking and past household DV (OR 1.12, 95% CI 1.05 to 1.18) or current household DV (OR 1.18, 95% CI 1.11 to 1.25), and between chewing and past household DV (OR 1.11, 95% CI 1.06 to 1.17) or current household DV (OR 1.20, 95% CI 1.15 to 1.26) compared to those living in DV-free households.

DISCUSSION

Using large, nationally representative samples, we find a strong association between experiencing DV and tobacco use, even after controlling for a range of individual and household level demographic and socioeconomic covariates. We also find that living in households with DV increases the likelihood of tobacco use for all its adult members. The positive association between DV and smoking among women found in this study is the first to be reported for a developing country, and is consistent with those observed in developed countries.[12–15] While some studies have looked at the relation between smoking and exposure to household violence among children,[16 30] we believe that this is the first study to investigate this relation among adults.

What accounts for the association between DV and tobacco use? Various explanations have been proposed to justify the role of social context for smoking. Many of these theories focus on aspects of social interaction that include power, physicality, consumption, identity, desire and geography.[31] Nonetheless, the majority of the work in this field has focused on DV as a marker of psychosocial stress.[12 13 15 32–34] It is believed that smoking is associated with elevated levels of stress,[17] even though there is considerable debate about the underlying causal mechanisms.[18] One plausible explanation is that one or more of the chemical components in tobacco have a pharmacological effect on the metabolic expression of stress in individuals who use tobacco, with the majority of this research focusing on the effects of nicotine. It has been suggested that nicotine may reduce the metabolic expression of stress through an opioid mechanism, by activating a reward pathway such as the mesolymbic dopamine system, or by dampening sympathetic responses to stressful stimuli, although conclusive evidence is still lacking in these areas.[35–37] In a related vein, increases in mesolimbic dopamine release that result from both stress and nicotine exposure suggest that stress may simply be priming the body to react more favourably to tobacco use, although this hypothesis has never been empirically tested.[38 39] Other research has found that smoking serves to reduce immediate stressful feelings, but only in the presence of a distraction, indicating that nicotine may moderate the effect of cognitive attention on stress.[40 41] Alternatively, the major role of smoking may be to manage the symptoms of nicotine withdrawal, commonly perceived as stress, since longitudinal studies have found that smoking cessation is followed by a temporary increase in symptoms of

Table 1 Descriptive information of the samples

Variable	Women's sample Subjects (%)	Full sample Subjects (%)
Recency of own/household abuse		
Never abused	72162 (81.0)	218338 (78.3)
Abused more than one year ago	8193 (9.2)	29130 (10.4)
Abused in the past year	8737 (9.8)	31509 (11.3)
Location		
Large city	9854 (11.1)	32695 (11.7)
Small city	5691 (6.4)	18527 (6.6)
Town	12220 (13.7)	39061 (14.0)
Village	61327 (68.8)	188694 (67.6)
Religion		
Hindu	69234 (77.7)	214584 (76.9)
Muslim	10582 (11.9)	34247 (12.3)
Christian	4972 (5.6)	15755 (5.7)
Other/missing religion	4304 (4.8)	14391 (5.2)
Caste		
General	37218 (41.8)	120855 (43.3)
Scheduled caste	15133 (17.0)	45465 (16.3)
Scheduled tribe	10847 (12.2)	32954 (11.8)
Other backward class	25894 (29.1)	79703 (28.6)
Marital status		
Married	83747 (94.0)	194574 (69.8)
Single	0 (0.0)	64134 (23.0)
Widowed	3589 (4.0)	17876 (6.4)
Divorced/separated	1756 (2.0)	2393 (0.9)
Education		
13 or more years	4503 (5.1)	20729 (7.4)
11–12 years	3821 (4.3)	20270 (7.3)
9–10 years	10224 (11.5)	48028 (17.2)
6–8 years	11045 (12.4)	42417 (15.2)
1–5 years	14676 (16.5)	46885 (16.8)
No formal schooling	44823 (50.3)	100648 (36.1)
Living standard		
5th (highest) quintile	17884 (20.1)	61702 (22.1)
4th quintile	18309 (20.5)	60065 (21.5)
3rd quintile	18050 (20.3)	57123 (20.5)
2nd quintile	17903 (20.1)	53178 (19.1)
1st (lowest) quintile	16946 (19.0)	46909 (16.8)
Employment		
Not working	56244 (63.1)	
Unpaid	9070 (10.2)	
Paid non-manual	4244 (4.8)	
Paid agricultural	11876 (13.3)	
Paid manual	7658 (8.6)	
Pregnancy		
Not pregnant	82715 (92.8)	
Pregnant	6377 (7.2)	
Body mass index (kg/m^2)		
<17	10691 (12.0)	
17–18.49	15019 (16.9)	
18.5–22.99	39560 (44.4)	
23–24.99	7502 (8.4)	
⩾25	9885 (11.1)	
Missing BMI	6435 (7.2)	
Age (women's sample)		
15–19	6729 (7.6)	
20–24	15787 (17.7)	
25–29	17963 (20.2)	
30–34	15652 (17.6)	
35–39	13635 (15.3)	
40–44	10856 (12.2)	
45–49	8470 (9.5)	
Age (full sample)		
15–24		87309 (31.3)
25–44		122681 (44.0)
45–64		51531 (18.5)
⩾65		17456 (6.3)
Sex		
Female		140933 (50.5)
Male		138044 (49.5)
Total	89092 (100.0)	278977 (100.0)

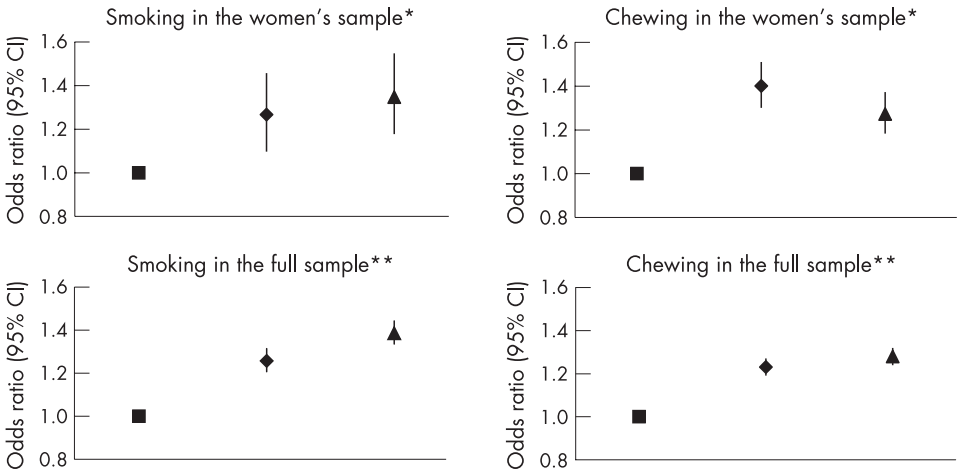

Figure 1 Odds ratios and confidence intervals for smoking and chewing by own abuse recency in the women's sample and by household abuse recency in the full NFHS. Square represents never abused; diamond represents abuse more than one year ago; triangle represents abuse in the previous year. *Adjusted for location of residence, age, religion, caste, marital status, education, employment, living standard, pregnancy status and body mass index. **Adjusted for location of residence, age, sex, religion, caste, marital status, education and living standard.

stress followed by a reduction of these symptoms to levels below those observed during the baseline period before cessation.[42] Since tobacco chewing results in a similar though rather slower uptake in nicotine compared with smoking,[43] these nicotine related theories of stress and smoking probably apply to tobacco chewing as well. Regardless of the actual mechanisms, however, there is a widespread belief among smokers in the developed world that tobacco use relieves stress,[19] a sentiment that is shared by people in India who smoke or chew tobacco.[20 21] This suggests that, apart from any physiological link between smoking and stress, people in India may view tobacco use as a convenient and low cost method for managing symptoms of stress.

The results of this study must also be seen in light of the association between DV and stress. A recent review of studies from the developed world described the increased incidence of stress among women who have been victims of physical violence and indicated that the severity of psychological outcomes increases with an increase in the severity and recency of abuse.[9] Studies of women in India and Pakistan have also established an association between DV and poor mental health outcomes among south Asian women.[11 44] At the same time, a recent meta-analysis of 118 studies has shown a strong relation between witnessing domestic violence and behaviours indicating elevated levels of stress in children.[10] Taken together, these findings form a plausible link whereby the stress of experiencing DV and being part of a household where DV is active could promote the use of tobacco products.

Limitations

The following caveats need to be considered while evaluating the study findings. The cross sectional design of this study does not allow for the establishment of a causal link from DV to tobacco use. It is possible that the observed relation between DV and tobacco use among women is the result of reverse causation such that a family member's displeasure with a woman's tobacco use leads to abuse.[45] It may also be possible that omitted variable bias is responsible for the observed association between DV and tobacco use. For example, it may be that childhood poverty increases the risk of both tobacco use and having a poor dowry, the latter of which has been shown to increase the risk of DV victimisation.[46] However, this investigation did control for numerous demographic characteristics, risk factors and key measures of socioeconomic status.

The lack of a clear dose-response relation between DV and tobacco chewing warrants attention. If experiences of abuse cause a woman to use tobacco, we would expect that current tobacco use would be more strongly related to current abuse than to past abuse. This dose response was not observed for chewing in the women's sample. It could, however, be that a key developmental period for tobacco chewing initiation for women is in late adolescence and young adulthood. Past abuse, which took place during this critical developmental period in a person's life, may indeed be more important in predicting current tobacco use habits than is current abuse. Although longitudinal studies of tobacco chewing among Indian women are conspicuous by their absence, cross sectional research indicates that tobacco chewing initiation continues throughout adulthood and chewing prevalence peaks in the seventh decade of life.[6]

Use of tobacco smoking and chewing was not self reported, but reported by the respondent to the household survey. If a person had concealed his or her tobacco use from other family members, it may not have been reported during the household survey. Moreover, if DV were more likely to occur in households where other family members know of and disapprove of the woman's tobacco use, this could have biased the results of this study. However, the analysis of the women's sample revealed similar associations between DV and both forms of tobacco use, smoking and chewing, despite the greater social stigma associated with smoking among Indian women.[1 47] If the relation between DV and tobacco use resulted solely from abuse occurring when family members discovered and consequently punished a woman for her tobacco use, we would expect the association of DV and smoking, which is highly stigmatised, to be much stronger than that of DV and tobacco chewing, a behaviour associated with much less stigma.

Finally, previous research has shown that domestic violence surveys with multiple behaviourally specific questions tend to elicit more accurate results compared to the global screening questions used in the NFHS.[48] This indicates that the rate of domestic violence reported in this study may underestimate that of the general population. Indeed, the 19% lifetime abuse rate reported in this study is substantially lower than the 40% rate reported in a multisite study in India that used multiple questions about many specific types of domestic violence victimisation.[11] If under-reporting of DV were related to tobacco use, this could bias the results of our study. However, in most cases, the person reporting the tobacco use was not the woman who reported her own DV, so any under-reporting of DV victimisation is likely to be unrelated to the report of tobacco use.

Conclusion

To our knowledge this study is the first to report an association between DV and tobacco use in the context of developing

What this paper adds

- Personal experiences of domestic violence are associated with higher rates of smoking and chewing tobacco in Indian women
- Living in households that experience domestic violence is associated with higher rates of smoking and chewing tobacco in India for all its adult members
- Efforts towards tobacco control need to consider the psychosocial circumstances under which people practise these unhealthy behaviours

economies, including India. While better study designs, and data collection measures are warranted to understand the connections between DV and smoking, our study provides the basis to consider the importance of widespread psychosocial risk factors as a part of the public health agenda. The results from this study provide information for those working to raise awareness of the harmful health effects of DV, including those that operate by promoting adverse health behaviours. For instance, in a recent study, domestic violence was shown to be associated with asthma in India,[49] suggesting the direct part that psychosocial stress may play in the aetiology of that disease. Findings from the current study suggest an indirect role that psychosocial stress may have in increasing poor health outcomes such as asthma, cancer and heart disease via increasing smoking, a known risk factor for these diseases. However, rather than simply viewing psychosocial exposures as risk factors that individuals should be taught to avoid, the strong correlation found in this study between domestic violence and tobacco use suggests policy responses that would consider the power differentials inherent in the dominant social structure.

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Contributors: SVS conceived the study, designed the analysis, and contributed to the interpretation of the results and writing of the manuscript. LA led the analysis, interpretation, and writing of the manuscript. IK, and EB contributed to the interpretation of the results. All authors reviewed and approved the final manuscript.

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