Psychology of tobacco use: Are anti-tobacco policies encouraging the use of smokeless tobacco? A cross-sectional study in an industrial township

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Background: Anti-tobacco policies are focused on curbing smoking. Less attention is given to the use of smokeless tobacco use. This raises the concern whether these policies lead to increased use of smokeless tobacco use. The present study addresses this issue.

Materials and Methods: A stratified random sample of 399 participants over 18 years and both genders were part of this cross-sectional study. They included an interview of urban and rural residents by house-to-house survey including outpatients, inpatients, and college students. Information was collected by face-to-face interview on a standard instrument for recording tobacco use. Additional questions were added to elicit switch from smoking to smokeless forms of tobacco. In-depth interviews were also held with some tobacco vendors.

Statistical Analysis: Data were summarized in percentages and with mean and standard deviation. Chi-square and two sample t-tests were used to explore associations.

Results: Prevalence of smokeless tobacco use was 36.59% (95% confidence interval: 31.97%–41.41%). Smokeless tobacco use was highest in rural community at 60.20% compared to urban community in which it was 40%. Unskilled workers had the highest prevalence of smokeless tobacco use at 48.57% compared to lowest prevalence among professionals (12.50%). Years of schooling was inversely related to both smoking and smokeless tobacco use. Prevalence of smoking at 20.55% was much less than use of smokeless tobacco use. Awareness of adverse health effects and ban in public places were the main reasons for quitting smoking. About 10% of those who quitted smoking took smokeless tobacco. Conclusion: There was a tendency among tobacco users to switch over to smokeless tobacco use due to awareness of health effects and ban on smoking in public places. A much higher prevalence of smokeless tobacco use compared to smoking suggests that the problem of smokeless tobacco use is receiving less attention from policymakers vis-à-vis smoking control policies.

Keywords: Anti-tobacco policies, smokeless tobacco, smoking, switch
tobacco uses such as chewable tobacco and snuff get excluded from this embargo. In developed countries, such as the US, tobacco control activities started in 1964 following publication of the report: “Smoking and Health by the Surgeon General.”[10] The initial trend was to switch to supposedly less harmful forms of tobacco such as cigars and to their version of smokeless tobacco, snus, a moist powdered tobacco product placed under the lip for extended periods.[11]

A similar concern can be expressed in the Indian context. The Cigarettes and Other Tobacco Products Act 2003[12] lays more stress on cigarettes and smoking. There is ban of smoking in public places. As a result, one may expect more people may switch over to smokeless forms of tobacco use such as chewable tobacco, which is quite common in India.

This is also suggested by the results of the National Family Health Surveys carried out in 1998–1999 and 2009–2010. Over this decade, use of smokeless tobacco increased from 28% in males and 12% in women to 33% in males and 18% in females.[12] In a recent study, Sinha et al.[6] reported a rising trend of use of smokeless tobacco products in India and Bangladesh, coinciding with legislation stressing more on cigarettes and smoking and delay in implementing policies concerning smokeless tobacco. In this study, the secular trend for the decade 2004–2013 was studied which showed a significant alarming rise in smokeless tobacco use during the period in both men and women in India. In men, the prevalence of smokeless tobacco increased from 27.1% to 33.4%, P < 0.001; among women, the prevalence increased from 10.1% to 15.7%, P < 0.001.[6]

In India, the users of smokeless tobacco are more than double those of smokers.[12] Due to this, the country has the potential to be a happy hunting ground for tobacco manufacturers diverting their focus from tobacco promotion to smokeless tobacco use. The ecological correlation between tobacco control policies (with the main emphasis on banning smoking) and increase in smokeless tobacco use over the past decade is a matter of concern. However, ecological studies are a weak form of evidence.

The research question is: Is this increase in use of smokeless tobacco products related to the discouragement of smoking in public places? Are we curbing the risk of lung cancer at the cost of increasing the risk of oral cancer? Is the ban of smoking in public places providing a “nudge”[7] to those habituated to nicotine to switch over to smokeless forms of tobacco?

No study exploring this concern could be retrieved in the medical literature. The present study endeavored to explore this research question by both quantitative and qualitative methods – a mixed-methods approach.

MATERIALS AND METHODS

Study setting
The study was carried out in a tertiary care hospital and teaching college and its field practice areas in an industrial township and rural households in the catchment area of the rural health training center of the medical college. A large number of industrial workers hail from these locations.

Sample size and sampling method
Being a preliminary explorative study, the sample size was calculated on presumption of 50% prevalence of smokeless tobacco use in the study population. This was a default presumption which estimates for the maximum sample size required for an exploratory study. Using this benchmark and with a 95% confidence limit of 5% and design effect of 1, the sample size calculation using Stat Calc function of Epi Info 7 developed by Center for Disease Control and Prevention, Atlanta, USA.[8] software was 384. In the actual survey, information was collected from 399 participants for quantitative study.

Selection of study sample for quantitative study
The target age group and gender were adults above 18 years of age belonging to both genders. People belonging to religious groups which prohibit tobacco use (e.g., Sikhs) were excluded from the study sample. A stratified sample of 399 was selected from the following sites:

- Outpatients in tertiary care hospital: 52
- Inpatients in tertiary care hospital: 50
- House-to-house survey – urban health center: 98
- House-to-house survey – rural health center: 98
- College students: 101
- Total: 399.

Sampling for the qualitative study
For the qualitative part of the study, a purposive sample of five tobacco vendors for in-depth interviews was selected. The investigator also observed few of the customers visiting pan shops and their choice of tobacco product. The investigators also purchased smokeless tobacco products to study the health warning on the packaging.

Data collection
For the quantitative part of the study, information was collected on a standard instrument for the assessment of tobacco use with few additional questions to assess the switch from smoking to smokeless tobacco forms. The Global Tobacco Surveillance System, Tobacco Questions for Surveys, developed by the Centers for Disease Control
and Prevention, Atlanta, and the WHO, were used for collecting information on tobacco use.[9]

**Statistical analysis**

Epidemiological and statistical software Epi Info 7[9] was used for data entry and statistical analysis. Categorical data were summarized by percentages with 95% confidence intervals (CIs), while quantitative data were summarized by mean and standard deviation (SD). For inferential statistics, Chi-square and odds ratios with 95% CIs were used for categorical data, and parametric tests such as two sample t-test were used for quantitative data.

**Ethical clearance**

Prior to collection of data, ethical clearance from the institutional ethical committee was obtained.

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**RESULTS**

**Demographic profile of the study sample**

The mean age of the study sample was 34.72 years with SD of 16.76 years. The youngest participant was 18 years old and the oldest participant was 80 years old. Majority of the respondents, 75.94% (303/339), were males and 24.06% (96/339) were females. Majority, 59.65% (238/399), were semi-skilled industrial workers; 18.80 (75/339) were skilled workers; 17.54 (70/339) were unskilled workers; and a small proportion, 4.01% (16/339), were professional people.

The mean schooling of the study sample was 10.75 years with SD of 4.13 years. Five percent of the participants were illiterate. Majority, 286 (71.68%), of the respondents belonged to nuclear family, while 113 (28.32%) were from joint families. One hundred and ninety-six participants (46.37%) were single; 15 (0.99%) were separated.

**Prevalence of use of smokeless tobacco in the study population**

The prevalence of use of smokeless tobacco in any form was quite high with point estimate of 36.59% with 95% CI of 31.97%–41.41%.

**Association of smoking with source of stratified sample**

As depicted in Table 1, the use of smokeless tobacco was highest in the rural community at 60.20%, while in urban community, it was about 40%. It was lowest among college students. These differences were statistically significant (P < 0.001).

**Association of occupation with use of smokeless tobacco**

The use of smokeless tobacco was lowest among professional class where prevalence was 12.50% and highest among the unskilled workers where it was 48.57%.

This trend was statistically significant (P = 0.01) [Table 2].

**Association of years of schooling with use of smokeless tobacco**

The mean schooling years was 12.34 years (SD: 3.43 years) who did not use smokeless tobacco products compared to those who used smokeless tobacco products in whom the mean years of schooling was 8 years (SD: 3.8 years). Therefore, users of smokeless tobacco were likely to have 4 years less of schooling. This difference was statistically significant (P < 0.001, two-sample t-test).

**Prevalence of smoking in the study population**

Prevalence of smokers at 20.55% (95% CI 16.8%, 24.73%), was lower than prevalence of smokeless tobacco users which was 36.59% (95% CI 31.97%, 41.41%). This difference was statistically significant (P < 0.05), as the 95% CIs do not overlap.

**Association of smoking with location**

Unlike with smokeless tobacco where the rural population showed a much higher use (60.20%) compared to urban population (40.82%), for smoking, the prevalence in urban and rural populations was almost similar with 28.57% and 29.59%, respectively. However, the prevalence of smoking in urban population at 28.57% was much lower than the prevalence of smokeless tobacco in urban population which was 40.82% [Table 3].

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Table 1: Association of source of sample and use of smokeless tobacco

| Location                  | Current user of SLT products | Total (%) |
|---------------------------|------------------------------|-----------|
|                           | Not taking tobacco (%)       | Taking tobacco (%) |
| Urban community sample    | 58 (59.18)                   | 40 (40.82) | 98 (100) |
| Rural community sample    | 39 (39.80)                   | 59 (60.20) | 98 (100) |
| Inpatients’ sample        | 30 (57.69)                   | 22 (42.34) | 52 (100) |
| Outpatients’ sample       | 26 (52)                      | 24 (48)   | 50 (100) |
| Sample of college students| 100 (99.01)                  | 1 (0.99)  | 101 (100) |
| Total                     | 253 (63.41)                  | 146 (36.59) | 399 (100) |

χ²=83.01; df=4; P<0.001. SLT – Smokeless tobacco

Table 2: Association of occupation with current use of smokeless tobacco

| Occupation     | Current user of SLT products | Total (%) |
|----------------|------------------------------|-----------|
|                | No (%)                       | Yes (%)   |
| Professional   | 14 (87.50)                   | 2 (12.50) | 16 (100) |
| Skilled        | 43 (57.33)                   | 32 (42.67) | 75 (100) |
| Semiskilled    | 160 (67.23)                  | 78 (32.77) | 238 (100) |
| Unskilled      | 36 (51.33)                   | 34 (48.67) | 70 (100) |
| Total          | 253 (63.41)                  | 146 (36.59) | 399 (100) |

χ²=11.02; df=3; P=0.01. SLT – Smokeless tobacco
Association of occupation with smoking
The trends in smoking were just the reverse compared to the use of smokeless tobacco. While the unskilled class had the highest prevalence of smokeless tobacco use, the professional class were the heaviest smokers at 37.50% compared to the unskilled class which had a smoking prevalence of 15.71%. This trend was statistically significant ($P = 0.02$) [Table 4].

Association with level of schooling and smoking
With regard to use of smokeless tobacco, more schooling was associated with lower levels of smoking among those more educated. Among smokers, the mean schooling was 9.67 years (SD: 3.37 years) compared with nonsmokers in whom mean schooling was 11.04 years (SD: 4.27 years). This difference was statistically significant ($P < 0.001$; two-sample $t$-test).

History of past and present smoking
In our sample, 29.82% were either present or past smokers. That means that about 9% of smokers had given up smoking since the present prevalence of smokers was 20.55%. Besides those who successfully could quit smoking, there were some who made unsuccessful attempts at quitting.

Reasons for quitting or trying to quit smoking
Social pressure was the reason given by 7.77% of the participants; smoking ban in public places by 10.28%; and other reasons such as awareness of health risks given by 11.79% [Table 5].

Frequency of smoking replaced by use of smokeless tobacco products
An appreciable proportion (10.53%) of smokers replaced their smoking habit by switching over to smokeless tobacco products [Table 6].

Opinion among study participants whether ban of smoking in public places has increased the use of smokeless tobacco?
The opinion differed with about half saying that ban on smoking increased smokeless tobacco use, while the other half felt it caused no increase in smokeless tobacco use.

Awareness about harm of smokeless tobacco products compared to smoking
This is illustrated in Table 14. An appreciable proportion (44.36%) thought that smokeless tobacco products are less harmful than smoking.

Results of qualitative study
The information obtained on informal talks with tobacco vendors was mixed. While the younger vendors did not feel

| Table 3: Source of sample and smoking status |
|---------------------------------------------|
| **Location** | **Smoker/non-smoker** | **Total (%)** |
| | **Nonsmoker (%)** | **Smoker (%)** |
| Urban community | 70 (71.43) | 28 (28.57) | 98 (100) |
| Rural community | 69 (70.41) | 29 (29.59) | 98 (100) |
| Inpatients’ sample | 37 (71.15) | 15 (28.85) | 52 (100) |
| Outpatients’ sample | 40 (80) | 10 (20) | 50 (100) |
| Sample of college students | 101 (100) | 0 | 101 (100) |
| Total | 317 (79.45) | 82 (20.45) | 399 (100) |

$\chi^2=37.09; df=4; P<0.001$

| Table 4: Association of occupation with smoking |
|-----------------------------------------------|
| **Occupation** | **Smoker/non-smoker** | **Total (%)** |
| | **Nonsmoker (%)** | **Smoker (%)** |
| Professional | 10 (62.5) | 6 (37.5) | 16 (100) |
| Skilled | 52 (69.33) | 23 (30.67) | 75 (100) |
| Semiskilled | 396 (82.35) | 42 (17.65) | 238 (100) |
| Unskilled | 59 (84.29) | 11 (15.71) | 70 (100) |
| Total | 317 (79.45) | 82 (20.45) | 399 (100) |

$\chi^2=9.74; df=3; P=0.02$

| Table 5: Reasons for quitting or trying to quit smoking |
|-----------------------------------------------|
| **Reasons to quit smoking** | **Frequency (%)** | **Cumulative (%)** |
| (if a smoker) | | |
| Social pressure | 31 (7.77) | 7.77 |
| Smoking ban in public spaces | 41 (10.28) | 18.05 |
| Others (awareness, health reasons) | 47 (11.79) | 29.84 |
| Not applicable | 280 (70.16) | 100.00 |
| Total | 399 (100.00) | 100.00 |

| Table 6: Frequency of smoking replaced by use of smokeless tobacco product |
|-----------------------------------------------|
| **Smoking replaced by SLT** | **Frequency (%)** | **Cumulative (%)** |
| | | |
| Not applicable | 317 (79.45) | 79.45 |
| Yes | 42 (10.53) | 89.98 |
| No | 40 (10.02) | 100.00 |
| Total | 399 (100.00) | 100.00 |

SLT – Smokeless tobacco

that smokers were switching over to smokeless tobacco forms, the elderly tobacco vendors felt this change in behavior on the part of the customers.

On observation also, the investigator noted that mostly customers, particularly those of modest means, were preferring smokeless tobacco products rather than cigarettes or bidis.

The investigator also purchased a smokeless tobacco packet to study the health warning, which is depicted in Figure 1.
According to Figure 1, the health warning does not cover 85% of the principal display area (PDA) as stipulated by the “Packaging and Labeling Amendment Rules 2014.”

Another important feature to note is that the warning is about harm due to smoking and it did not mention the harm of smokeless tobacco use in spite of the fact that the product is for chewing not smoking.

**DISCUSSION**

The prevalence of smokeless tobacco use at 36.59% in the present study was quite high. This was much more than the prevalence of smoking which was 20.55% in the same study population. This indicates that at present there may be a tendency to switch over to smokeless tobacco use. It has been stated that smokeless tobacco use is an understudied problem in South East Asia. Therefore, the health burden due to this may be underestimated.

Another interesting finding was that smokeless tobacco use was more among unskilled class compared to professional class. Furthermore, the use of smokeless tobacco was more among the sample drawn from the rural community, while the prevalence of smokers was more of less similar in the rural and urban populations. This has been also reported in the literature. Sinha *et al.* state that smokeless tobacco is more commonly used in the rural areas and among disadvantaged people.

Both smokeless tobacco and smoking were inversely related to years of schooling. Therefore, better education may help in imbibing the health education messages of hazards of tobacco use.

About 9% of the present participants had been past smokers who switched over to smokeless tobacco. Besides, some of the present smokers in the study also had made attempts to quit from time to time. The reasons for quitting or trying to quit were awareness about the health risks of smoking, ban of smoking in public places, and social pressure in that order. The matter of concern was that more than 10% of the smokers who quitted or tried to quit replaced the habit with use of smokeless tobacco.

The trend of switching over to smokeless tobacco use as a means to quit smoking has also been reported in the West. Rodu and Phillips reported that 359,000 men switched to smokeless tobacco use in their attempt to quit smoking as revealed in a country-wide health interview survey in the US. The only concern in the study by Rodu and Phillips is that the authors state that switching to smokeless tobacco use from smoking provides all the health benefits of complete tobacco abstinence. This is debatable given the enormous burden of oral cancer in our country and other health risks associated with smokeless tobacco use. As the study was sponsored by “unrestricted grants from smokeless tobacco manufacturers,” such statements should be interpreted with caution.

In addition, an important finding is that more than half of the respondents believed that ban of smoking in public places has increased the use of smokeless tobacco. This may require measures to curb and educate the people about the harms of smokeless tobacco use, besides some forms of legislation to restrict the sale and distribution of these products.

An appreciable proportion (44.36%) of the study population also believed that smokeless tobacco use is less harmful than smoking. This myth may explain to some extent why people who gave up smoking switched over to smokeless tobacco use. This may also explain the alarming rise in secular trend in the use of smokeless tobacco in India in the decade 2004–2013 by Sinha *et al.*

In this context, the finding of this qualitative study demonstrated the inadequate and misleading health warning on the package of smokeless chewable tobacco [Figure 1]. Besides not covering 85% of the PDA as stipulated by the “Packaging and Labeling Amendment Rules 2014,” the message in Figure 1 conveys that smoking is harmful without mentioning anything about the harm caused by chewable tobacco. This may mislead people to the thought that chewable tobacco is safe. Legislation should be strengthened to take punitive action against manufacturers who give health warning to subtly mislead the consumer of tobacco products and “nudge” them toward switching over from smoking to smokeless tobacco use.
CONCLUSION

From the study, we conclude that the prevalence of use of smokeless tobacco is high – much higher than tobacco smoking. The reasons for this are likely to be that smokeless tobacco use is believed to be less harmful than smoking as reported by an appreciable number of participants. Other reasons given for the switch from smoking to use of smokeless tobacco were peer pressure, ban of smoking in public places, and awareness of health risks associated with smoking. The study also demonstrated that both use of smokeless tobacco and smoking were inversely related to years of schooling. The study also found that health messages on smokeless tobacco packages were inadequate and misleading.

Based on the study findings, the following suggestions are made:

• More awareness should be created about the harmful effects of smokeless tobacco products
• Better education and messages about the harmful effects of all tobacco products in all schools should be imparted as lesser years of schooling was related to tobacco use
• Legislation to curb the promotion of smokeless tobacco manufacturers should be better implemented as misleading labeling was seen on smokeless packets purchased from tobacco vendors.

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Conflicts of interest
There are no conflicts of interest.

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