

Original article:

**Study of assessment of prevalence and patterns of tobacco use and tobacco induced oral lesions in rural population of Western Maharashtra: An epidemiological study**

**<sup>1</sup>Dr. Anita Munde, <sup>2</sup>Dr. Lingraj Harihar, <sup>3</sup>Dr. Vinay Vadvadgi, <sup>4</sup> Dr. Atul Nikam ,  
<sup>5</sup>Dr. Ravindra Karle, <sup>6</sup> Mr. Hemant Pawar**

<sup>1</sup>Professor , Department of Oral Medicine and Radiology, Rural Dental College, Pravara Institute of Medical Sciences, Loni

<sup>2</sup>Lecturer , Department of Oral Medicine and Radiology, Rural Dental College, Pravara Institute of Medical Sciences, Loni

<sup>3</sup>Associate professor , Department of Periodontology, Rural Dental College, Pravara Institute of Medical Sciences, Loni

<sup>4</sup>Associate professor, Department of Oral Pathology and Microbiology, Swargiya Dadasaheb *Kalmegh Smruti Dental College* and Hospital, *Nagpur*, Maharashtra, India

<sup>5</sup>Professor, Department of Pathology, Rural Medical College, Pravara Institute of Medical Sciences, Loni

<sup>6</sup>Associate professor, Department of Preventive and social Medicine, Rural Medical College, Pravara Institute of Medical Sciences, Loni

Corresponding Author- Dr Anita Munde, M.D.S, Professor , Department of Oral Medicine and Radiology , Rural Dental College, Pravara Institute of Medical Sciences, Loni , Email : anitakarle7@gmail.com

**Abstract-**

**Background :** Tobacco use is a major public health problem globally and has been identified for initiation and progression of oral cancer. According to WHO, consumption of tobacco has been growing at the rate of 2% to 5% per annum. It is estimated that number of deaths due to tobacco will increase from 3 million per year worldwide to 70 million per year by 2025.

**Objective:** To estimate the prevalence and patterns of tobacco use and tobacco induced oral lesions in rural population of Western Maharashtra.

**Materials and Methods:** This cross sectional epidemiological study was conducted as house to house survey where the selected population was divided in to 30 clusters. 3100 participants were interviewed through a questionnaire. Data on demographics, education, occupation, socioeconomic status were collected along with details regarding tobacco use and duration of the habit. Trained examiners carried out intraoral examination for assessment of incidence of tobacco induced lesions including oral precancer and cancer. Prevalence of tobacco chewing and smoking, and their sociodemographic correlates, were examined.

**Results:** The overall prevalence of tobacco use was 52.70%; the prevalence of smoking and tobacco chewing were 9.48% and 43.22%, respectively. The prevalence of tobacco induced lesions was 34.90%.The study revealed statistically significant correlation between the duration of habit and the occurrence of lesions and significant association between habit and sex.

**Conclusions:** Prevalence of tobacco use is considerably high among the studied population. Demographic and socioeconomic determinants and spatial distribution should be considered while planning tobacco control interventions.

**Key words:** Chewing tobacco, smoking, , tobacco induced lesions, prevalence, oral precancer, oral cancer

### **Introduction:**

Of the various drugs abused, the most widely distributed and commonly used drug in the world is 'Tobacco'. It is one of the most important plant products, which gathers attention from all the health professionals, just because of the variety of diseases caused by its use which impacts nearly every organ of the body. These include several types of cancers, heart diseases and lung diseases. It is estimated that 250 million children and adolescents who are alive today, would die prematurely because of tobacco, most of them in developing countries.<sup>1</sup> Many social, economic and political factors have contributed to the global spread of tobacco consumption. The fast changing social milieus, social sanctions and other factors are mainly contributing to this proliferation and has posed serious challenge to individuals, families, societies and nations.<sup>2</sup> Over the past four decades, tobacco use has caused an estimated 12 million deaths in the world, including 4.1 million deaths from cancer, 5.5 million deaths from cardiovascular diseases, 2.1 million deaths from respiratory diseases and 94,000 infant deaths related to mothers smoking during pregnancy.<sup>3</sup>

On the world tobacco map, India occupies a very special place. As the second most populous country in the world, India's share of the global burden of tobacco-induced disease and death is substantial. As the second-largest producer and consumer of tobacco in the world, the complex interplay of economic interests and public health commitments becomes particularly prominent in the Indian context. There is, therefore, an even greater need to examine the case for comprehensive tobacco control programme in such a setting. According to the World Health Organization (WHO) estimates, in India, 194 million men and 45 million women use tobacco in smoked or smokeless forms.<sup>4</sup> The WHO also predicts that India will have the fastest rate of rise in deaths attributable to tobacco in the future

years. Tobacco use is one of the most important risk factors for the development of oral mucosal lesions including oral pre-cancer and cancer. India also has one of the highest rates of oral cancers in the world, partly attributed to high prevalence of tobacco chewing.<sup>5</sup>

In India, the practice of tobacco consumption varies from one state to another state and within each state. Therefore, it is important to gather information about the prevalence and patterns of tobacco habit among the local population. This helps to assess the epidemiological and behavioral patterns among the habitual users. Also, this information would help to develop and implement relevant tobacco intervention strategies. The incidence of potentially malignant diseases of the oral cavity is increasing and also showing predilection in younger age group due to increase in intake of smokeless form of tobacco.<sup>6</sup> However, considerable research is required to comprehend the actual trends and reliable prevalence data on tobacco consumption. Cross-sectional studies are important in estimating the prevalence of a disease in the population and identifying high-risk populations. There is inadequate data regarding the prevalence and patterns of use of tobacco and its related products among this rural population and hence the present epidemiological study was conducted.

### **Materials and Methods:**

The present study was conducted using a cross-sectional design to study the prevalence and patterns of various tobacco habits and to evaluate tobacco induced oral mucosal lesions among rural population of Western Maharashtra. Approval from the institutional ethical committee was obtained. Informed written consent was obtained from all subjects who participated in the study.

This study was conducted as house to house survey, cluster sampling method was employed for determination of sample size. The whole population of Rahata taluka was divided in to 30

clusters. The total sample size was 3100 subjects with confidence level (Z) at 95% and margin of error (d) at 2%. So from each cluster of village/town we selected 103 individuals randomly for collecting the data.

The team of investigators visited one cluster each day and randomly selected the subjects for assessment of prevalence of habit of tobacco consumption and prevalence of tobacco induced lesions including oral precancerous and cancerous lesions. The written consent was obtained from each subject after giving information about survey work. Initially a pre-tested structured questionnaire was given to each subject to collect the data regarding demographic details and habit of tobacco consumption. Those subjects who cannot read, for such individuals verbal questions were asked and the data was collected.

Trained examiners carried out intraoral examination for assessment of incidence of tobacco induced lesions such as tobacco pouch keratosis, leukoplakia, erythroplakia, oral sub mucous fibrosis (OSMF), oral cancer etc.

The data collected were tabulated in Microsoft Excel. Statistical analysis was done by descriptive statistics as mean, SD, percentage etc. The association between qualitative variables was done by applying Chi-square test at 5% (p,0.05) and 1% (p,0.01) level of significance. The statistical analysis software Systat version 12 was used to analyse the data.

## **Results :**

### **Demographic Profile**

The total number of participants who had completed the survey was 3100. The mean age of the sample was 41.58±15.98 years (range 10–90 years). The majority (50.19%) of the participants were between 20 and 39 years of age followed by 40–49 years (16.32%), 50-59 yrs (12.67%) and 60-69 yrs (11.19%). The gender distribution included 1786 males (57.62%) and 1314 females (42.38%). (Table1). Information on the occupational status of

participants showed that 34.52% were laborers, 19.42% were farmers and approximately 39.93% reported that they were unemployed. In addition, the majority of females were homemakers. Rural Indians tend to have higher levels of illiteracy and our study reflected that approximately 26.68% had no formal education, 8.48% reported primary level education, 40.87% had secondary school education, 14% were high school graduates, 8.06% were graduated and only 1.97% had a postgraduate degree. The educational status was higher among the males compared to females. Statistically significant difference was noted between education and gender. In the present study, most of the subjects (65.78%) were from lower socioeconomic class, followed by 32.41% from middle and only 1.81% subjects belonged to upper socioeconomic class.

### **Prevalence of the Habits**

The overall prevalence of tobacco use (in all forms) was 52.70% among all participants, out of which 68.38% were males. Among tobacco users, 9.48% smoked bidis and cigarettes while 43.22% chewed or used smokeless forms of tobacco such as plain tobacco or tobacco with lime, paan masala, paan, gutka, tobacco mishri, and other commercially available tobacco products. In smoked form of tobacco, cigarette smoking (5.06%) was more prevalent than bidi smoking (4.42%). In smokeless form of tobacco and other products, plain tobacco chewing (12.06%) was more prevalent, followed by tobacco with lime (10.58%), gutka chewing (9.74%), tobacco mishri application (7.12%), pan chewing with tobacco (2.06%), betel nut chewing (1.06%) and mawa chewing (0.60%). Except in tobacco mishri use, all the habits were more prevalent in males. (Table 2) By applying Chi-Square test there is a highly significant association between habit and sex.

In the different age groups, the habits were more prevalent at the age of 30-39 yrs (22.92%) and 40–49 years (22.50%) and least at the age of

more than 80 yrs (0.14%) and  $\leq 20$  years (2.31%).

Considering occupations in the study, 379 (23.25%) farmers were having tobacco habits while 30.98% (505) unemployed and 572 (35.09%) subjects having other occupations had tobacco habits. Education plays an important role in awareness of ill effects of deleterious habits and this is reflected in this study. Only 4.76% graduates and 0.92 % postgraduates were tobacco users while 30.43% noneducated subjects were having tobacco habit. In the present study there was statistically significant association between socioeconomic status and habits of patients. In our study, overall, the duration of habit was longer in males. It was observed that, total 422 (28.05%) subjects were having a very chronic habit (more than 20 yrs) of tobacco. 21.79% subjects were having the habit since 6-10 yrs. In the segment of 1-5 yrs duration, there were 20.60% subjects. 14.95% patients had duration of the habit in 16-20 years group. In category of 11-15 years duration, there were 10.89% patients. The least number of subjects [56 (3.72 %)] were in category of less than 1 year duration where males and females were equal in number. By applying chi square test there was a significant association ( $p < 0.05$ ) between duration of habit and gender of the subject.

#### **Prevalence of Tobacco Induced Lesions**

The prevalence of tobacco induced lesions in the present study was 34.90% among both the sexes. Lesions were highly prevalent among males (72.46%) as compared to females (27.54%); these findings well correlate with the habit practiced among them. The difference in the occurrence of these lesions among sex is statistically significant ( $\chi^2 = 73.193.2$   $p < 0.01$ , highly significant). The most prevalent lesions were tobacco pouch keratosis (50.09%) and melanosis (40.57%). OSMF, smokers palate and leukoplakia was present in 50 (4.62%), 27 (2.49%) and 20 (1.85%) subjects respectively.

The prevalence of erythroplakia was 0.27% while oral cancer was present only in one patient (0.092%). (Table 3)

In the different age groups, the lesions were more prevalent at the age of 40-49 yrs(11.29%) and 50-59 years (7.25%) and were least below the age of 20 years (0.32%) and more than 80 yrs (0.58%). A difference in prevalence of tobacco induced lesions in different age groups did not show statistical significance. The highly prevalent lesion among males was tobacco pouch keratosis (55.61%), followed by melanosis (33.03%), OSMF(5.48%), smokers palate (3.44%), leukoplakia (1.91%), erythroplakia (0.38%) and oral cancer (0.12%). In females, melanosis was highly prevalent (60.40%) followed by tobacco pouch keratosis (35.57%), OSMF (2.35%), leukoplakia (1.68%). A difference in prevalence of the lesions in male and female was found to be statistically significant.

#### **Prevalence of Lesions in relation to habits**

Considering association between type of habit and type of the lesion, smokers palate was mostly observed in bidi and cigarette smokers while tobacco pouch keratosis which was most prevalent lesion in the study was seen in tobacco chewers and tobacco mishri users. Melanosis was present in all types of tobacco and other tobacco related habits. Leukoplakia was also seen in tobacco chewers and mishri users. (Table 4)

The occurrence of Lesions with duration of habit was also assessed, which revealed statistically significant correlation between the duration of habit and the occurrence of lesions. The highest number of lesions 290(26.48%) were found in subjects having the habit for more than 15 yrs duration, followed by 249 (22.67% ) and 240 (21.92%) lesions were present in subjects having habits in 1-5 yrs and 6-10 yrs duration respectively while only 74 (6.75%) lesions were present in those subjects who has the habit of less than 1 year duration.(Table 5)

**Table No.1: Age and sex wise distribution**

Age in years	Males		Females		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
<b>Less than 20</b>	86	4.82	63	4.79	<b>149(4.81%)</b>	<b>4.81</b>
<b>20-29</b>	459	25.70	436	33.18	<b>895</b>	<b>28.87</b>
<b>30-39</b>	379	21.22	280	21.31	<b>659</b>	<b>21.26</b>
<b>40-49</b>	309	17.30	197	14.99	<b>506</b>	<b>16.32</b>
<b>50-59</b>	235	13.16	158	12.02	<b>393</b>	<b>12.67</b>
<b>60-69</b>	206	11.53	141	10.73	<b>347</b>	<b>11.19</b>
<b>70-80</b>	86	4.82	32	2.44	<b>118</b>	<b>3.82</b>
<b>More than 80</b>	26	1.46	7	0.53	<b>33</b>	<b>1.06</b>
<b>Total</b>	<b>1786</b>	<b>57.62</b>	<b>1314</b>	<b>42.38</b>	<b>3100</b>	<b>100</b>
<b>Mean ± SD</b>	<b>42.65±17.41</b>		<b>40.13±16.24</b>		<b>41.58±15.98</b>	

**Table No.2: Habits wise distribution :**

Habit	Males		Females		Total	
	Number	%	Number	%	Number	%
<b>Bidi</b>	135	11.00	2	0.49	<b>137</b>	<b>4.42</b>
<b>Cigarette</b>	141	11.49	16	3.92	<b>157</b>	<b>5.06</b>
<b>Plain Tobacco</b>	319	25.99	55	13.48	<b>374</b>	<b>12.06</b>
<b>Tobacco with Lime</b>	267	21.76	61	14.95	<b>328</b>	<b>10.58</b>
<b>Gutakha</b>	251	20.45	51	12.50	<b>302</b>	<b>9.74</b>
<b>Tobacco mishri</b>	61	4.97	160	39.21	<b>221</b>	<b>7.12</b>
<b>Betel Nut</b>	12	0.97	21	5.15	<b>33</b>	<b>1.06</b>
<b>Pan with tobacco</b>	23	1.87	41	10.04	<b>64</b>	<b>2.06</b>
<b>Mawa</b>	18	1.47	1	0.24	<b>19</b>	<b>0.60</b>
<b>Total</b>	<b>1227</b>	<b>68.70</b>	<b>408</b>	<b>31.05</b>	<b>1635</b>	<b>100.00</b>

Value of  $\chi^2 = 445.61$ ,  $p < 0.001$ , highly significant.

**Table No.3: Association between sex and Lesion**

Lesion	Males		Females		Total	
	Number	%	Number	%	Number	%
<b>Tobacco pouch keratosis</b>	436	55.61	106	35.57	<b>542</b>	<b>50.09</b>
<b>Leukoplakia</b>	15	1.91	5	1.68	<b>20</b>	<b>1.85</b>
<b>Erythroplakia</b>	3	0.38	0	0.00	<b>3</b>	<b>0.27</b>
<b>OSMF</b>	43	5.48	7	2.35	<b>50</b>	<b>4.62</b>
<b>Smokers palate</b>	27	3.44	0	0.00	<b>27</b>	<b>2.49</b>
<b>Melanosis</b>	259	33.03	180	60.40	<b>439</b>	<b>40.57</b>
<b>Oral cancer</b>	1	0.12	0	0.00	<b>1</b>	<b>0.092</b>
<b>Any other</b>	0	0.00	0	0.00	<b>0</b>	<b>0</b>
<b>Total</b>	<b>784</b>	<b>72.46</b>	<b>298</b>	<b>27.54</b>	<b>1082</b>	<b>100.00</b>

Value of  $\chi^2 = 73.193$ ,  $p < 0.01$ , highly significant.

**Table No.4: Association between Habit and Lesions (Multiple responses)**

Habit	Lesions							
	Tobacco pouch keratosis	Leukoplakia	Erythroplakia	OSMF	Smokers palate	Melanosis	Oral cancer	Any other
<b>Bidi</b>	42	0	0	3	20	57	0	0
<b>Cigarette</b>	19	1	0	2	6	25	0	0
<b>Plain Tobacco</b>	207	5	1	22	2	79	0	0
<b>Tobacco with Lime</b>	183	7	1	9	2	69	1	0
<b>Gutakha</b>	47	4	0	3	0	23	1	0
<b>Tobacco mishri</b>	197	8	2	12	1	52	1	0
<b>Betel Nut</b>	11	1	0	1	0	11	1	0
<b>Pan with tobacco</b>	6	1	0	0	0	11	0	0
<b>Mawa</b>	4	0	0	0	0	5	0	0

Value of  $\chi^2 = 211.05$ ,  $p = 0.0001$ , significant

**Table No.5: Association between Duration of Habit and Lesions (Multiple responses)**

Duration of habit	Lesions							
	Tobacco pouch keratosis	Leukoplakia	Erythroplakia	OSMF	Smokers palate	Melanosis	Oral cancer	Any other
Less than 1 year	29	3	1	12	8	21	0	0
1-5 years	114	5	3	48	14	64	1	0
6-10 years	126	6	2	37	11	58	0	0
11-15 years	67	2	1	11	1	21	0	0
16-20 years	169	6	2	29	3	81	0	0
More than 20 years	137	3	0	0	0	0	0	0

Value of  $\chi^2 = 151.21$ ,  $p=0.0001$ , significant

#### Discussion :

Tobacco has been identified for initiation and progression of oral cancer. In India, tobacco consumption is responsible for half of all the cancers in men and a quarter of all cancers in women, in addition to being a risk factor for cardiovascular diseases and chronic obstructive pulmonary diseases. To reduce the mortality and morbidity of disease, it is important to screen all the patients with the history of tobacco habit, and early screening plays a vital role for early intervention and prevention of oral cancer. Tobacco cessation and education regarding the hazardous effects of tobacco is an essential component for reducing mortality and morbidity related to its use.<sup>7</sup>

Tobacco use is influenced by various factors, such as, individual attitudes, social acceptability, availability, advertising campaigns etc. Tobacco use in India differs from that of the globe, since the dominant form of tobacco used globally is the cigarette; however, in India only 20% of the tobacco is consumed as cigarettes, 40% is consumed as bidi and the rest in the smokeless forms.<sup>8</sup> Forms of tobacco chewing include pan chewing, pan-masala or gutkha (a chewable tobacco containing areca nut), and mishri (a

powdered tobacco rubbed on the gums as toothpaste).

The overall prevalence of tobacco use in our study was 52.70% which is higher than that in Karnataka (29.6%), Uttar Pradesh (34.6%),<sup>9</sup> and as well as national average of 30.2%.<sup>10</sup> In the present study, prevalence of tobacco use was 68.70% among men which is lower than that reported by Sinha et al. (71%),<sup>8</sup> but higher than that reported by Gupta et al. (52.6%),<sup>11</sup> National Family Health Survey (NFHS)-3 report (61.1%),<sup>12</sup> and in rural area of UP (51%).<sup>9</sup> In the present study, prevalence of tobacco use was 31.05% among women which is higher to rural area of Uttar Pradesh (9.2%);<sup>9</sup> in Maharashtra (15%-20%) as reported by Rani et al.<sup>13</sup> and Gupta et al. (17.7%) in north Indian community.<sup>11</sup> Male predominance was also reported in studies by Saraswathi et al.<sup>14</sup> and Behura et al.<sup>15</sup> This might be due to the fact that several occupations of men require a substantial amount of physical energy and a high level of concentration like in case of drivers with odd working hours. This can be stressful, which in conjunction with peer pressure can lead to the initiation of deleterious oral habits.<sup>16</sup> Occupation appeared influence men's tobacco

use more than that of women, because a large proportion of the women in this study were homemakers. High prevalence of oral habits in males as compared to females in the study, moreover, the habit was highly prevalent at the earlier age group among the males than females, probably due to practice of habit at an earlier age. These findings are similar to the earlier studies reported by Saraswathi et al.<sup>14</sup>, Shivakumar et al.<sup>17</sup> Zain et al.<sup>18</sup> Mehrotra et al.<sup>19</sup>, Jaber et al.<sup>20</sup>, Prashant et al.<sup>21</sup> and Hallikeri K et al.<sup>22</sup>

In this study, the use of smokeless tobacco was more common than the smoking form in males, which is consistent with the finding of Sinha et al.<sup>8</sup> but in contrast to the finding of Gupta et al.<sup>11</sup> In our study, almost 40% females were using tobacco mishri, a form of smokeless tobacco, which is consistent with the finding of Gupta et al.<sup>23</sup> Indian government has banned smoking in public places; however, has imposed no ban on smokeless products, which probably could be a reason why smokeless form is more prevalent in this sample studied. In our study, men practiced smoking as well as tobacco chewing, whereas women only chewed or applied tobacco for cleaning of teeth which is consistent with the observation made by Gupta et al.<sup>24</sup> Although smoking by women is not well accepted in the Indian society, consumption of smokeless tobacco is well accepted, and the use of mishri is a very common practice in Maharashtra and Goa. The mishri use among women was higher (39.21%) in our study than that reported by Pratinidhi et al. (30.9%).<sup>25</sup>

The total prevalence of lesions induced by tobacco among subjects was 34.90% which is more than to a study by Bhatnagar et al.<sup>26</sup>(16.8%), Kumar S et al.<sup>27</sup>(18.89%) and Patil et al.<sup>21</sup> (26.88%) and less than to studies by Sandeepa et al.<sup>28</sup> (42.4%), Mathew et al.<sup>29</sup> (41.2%),and Kaveri (54.17%).<sup>22</sup> These variations in prevalence could be due to the

differences in sample size and demographic factors.

Among the oral mucosal lesions found in smokers, smoker's melanosis and smoker's palate were the most frequently encountered lesions and this finding was consistent with that of previous studies by Saraswathi et al.<sup>14</sup>, Hedin et al.<sup>30</sup> Sujatha et al.<sup>16</sup> and Monisha et al.<sup>31</sup> Among chewers, tobacco pouch keratosis followed by melanosis, OSMF was found to be common, followed by leukoplakia. Similar finding was observed by Gupta et al.<sup>[32]</sup> and Reddy et al.<sup>33</sup> Irrespective of the type of habit, tobacco pouch keratosis followed by melanosis were the most commonly encountered lesions among patients. The prevalence of OSMF in the present study was 4.62%. In India, it ranges from 0.03% to 6.42%.<sup>27</sup> This prevalence was more than that reported by Mathew et al.<sup>29</sup> (2.01%), Bhatnagar et al.<sup>26</sup> (1.97%) and Kumar S et al.<sup>27</sup> (2.5%) and less than reported by kaveri et al.<sup>22</sup> (26.9%). The prevalence of leukoplakia in this study is 1.85% which is less than as reported by Kumar S et al.<sup>27</sup> (2.3%) and Patil PB et al.<sup>21</sup> (8.2%). In India, the prevalence of leukoplakia varies from 0.2% to 5.2% and the majority occurs in the age range of 35–45 years. Majority of the lesions affected tobacco users belonged to 40-49 and 50-59 year age group, which is in consistent with study by Kaveri H et al.<sup>22</sup> This finding matches with the analysis of the National Health and Nutrition Examination Survey (NHANES) database which emphasized that the chance of a lesion being present increased with age, thus suggesting tobacco use in older age as a significant predictor of oral lesions.<sup>13</sup>

Statistically significant correlation between the duration of habit and the occurrence of lesions was found in our study which is in agreement with the studies by Behura et al.<sup>15</sup> Sujatha et al.<sup>16</sup> and Kaveri et al.<sup>22</sup>

According to a study by the WHO, a majority of those dying due to smoking are illiterates and



from lower socioeconomic status. By the same token, a significant association was found for non educated subjects and subjects from lower socioeconomic status . It is likely that these people are less aware of the health hazards of tobacco consumption and often find themselves in conditions predisposing them to initiation of smoking and chewing of tobacco. Therefore, they are more likely to have higher degree of fatalism or higher overall risk taking behavior.<sup>13,34</sup>

According to WHO (2009) consumption of tobacco has been growing at the rate of 2% to 5% per annum. It is estimated that number of deaths due to tobacco will increase from 3 million per year worldwide to 70 million per year by 2025.<sup>35</sup>

Tobacco use and its consequences are clearly an impediment to the development of a healthy and prosperous society. Laws enforced by the Government alone are not sufficient to curb the

menace of tobacco. Preventive measures should start at grass root levels aimed at individuals who are at high risk for tobacco usage along with intervention at a community level and policy interventions by the policymakers. Health care professionals including dentists along with social scientists, public health workers with active involvement of the media and motivational/religious gurus should plan for regular out-reach activities including health education, de-addiction counseling, early detection etc, to help to curb this issue which will certainly help in creating a tobacco free society.

#### **Conclusion :**

Prevalence of tobacco use is considerably high among the studied population. Demographic and socioeconomic determinants and spatial distribution should be considered while planning tobacco control interventions.

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