

## RESEARCH COMMUNICATION

# An Integrated Approach to Worksite Tobacco Use Prevention and Oral Cancer Screening Among Factory Workers in Mumbai, India

Sharmila Pimple<sup>1\*</sup>, Mangesh Pednekar<sup>2</sup>, Parishii Majmudar<sup>1</sup>, Nilesh Ingole<sup>1</sup>, Savita Goswami<sup>3</sup>, Surendra Shastri<sup>1</sup>

## Abstract

**Background:** Tobacco control and cessation interventions are among the most cost effective medical interventions but health systems in low resource countries lack the infrastructure to promote prevention and cessation among tobacco users. Workplace settings have the potential to provide opportunities and access for tobacco prevention interventions. **Methods:** This is a single group study evaluating tobacco use prevention and cessation through a structured three stage intervention program for tobacco users comprising education on harmful effects of tobacco, oral cancer screening and behavior therapy for tobacco cessation at the worksite. **Results:** All the 739 workers who were invited participated in tobacco awareness program and were screened for oral pre cancer lesions. 291 (39.4%) workers were found to be users of tobacco in some form. Education, gender and alcohol use ( $p < 0.0001$ ) were some of the factors associated with tobacco user status. The prevalence of clinical oral precancer lesions among tobacco users was 21.6%. Alcohol consumption ( $p < 0.001$ ), the type of tobacco consumed ( $p < 0.018$ ), personal medical history of chronic diseases ( $p < 0.007$ ) and combined use of alcohol and tobacco ( $p < 0.001$ ) were some factors found to be associated with presence of oral pre cancer lesions. **Conclusion:** An integrated approach for worksite based tobacco use prevention with oral cancer screening program showed good acceptance and participation and was effective in addressing the problem of tobacco consumption among the factory workers.

*Asian Pacific J Cancer Prev*, 13, 527-532

## Introduction

Tobacco use is the largest cause of preventable morbidity and mortality worldwide. Tobacco kills a third to half of all people who use it, on average 15 years prematurely (Peto et al., 1992; Murray et al., 1997). By 2030, unless urgent action is taken, tobacco's annual death toll will rise to more than eight million (Mathers et al., 2006). The International Classification of Diseases (ICD-10) has recognized that "tobacco dependence" is also a disease (WHO 1994). Considering the social and economic impact of tobacco consumption, the adoption of "WHO Framework Convention on Tobacco Control" (WHO FCTC 2003) by the World Health Assembly on 24<sup>th</sup> May 1999 is an important landmark to achieve comprehensive tobacco control worldwide. India is the 7<sup>th</sup> country that has ratified the WHO FCTC in February 2004 (Tobacco Free Initiative 2011). But the major obstacle to tobacco control in developing countries like India is the lack of effective implementation of tobacco control strategies, with little evidence of a systematic tobacco control plan in place. To control the tobacco epidemic, the younger generation should be prevented from initiating tobacco use. Yet, the benefits of such a measure would only

be fully appreciated in the long term. In the short term, concerted efforts needs to be made for inducing current tobacco users to quit.

Tobacco control interventions are among the most cost effective of all medical interventions. Unfortunately priority for both tobacco control in general and tobacco cessation services in particular is lacking not only among health policy makers but also among practitioners of medicine. Tobacco Cessation is not viewed as key control strategy for tobacco control. More over tobacco cessation capacity is in its infancy in India, with no infrastructure to promote cessation among tobacco users. Though, on a small scale, the Ministry of Health and Family welfare, Government of India has taken a positive stand and has opened eighteen Tobacco Cessation Clinics, mostly in big cities, all over India, but there is a need for more integration of such clinics with health services at various levels for current tobacco users who are unable to quit because of nicotine dependence.

Under these circumstances the workplace is one such favourable setting for the implementation of anti-tobacco interventions through which large groups of people can be reached to encourage tobacco cessation (Cahillet al., 2008). Workplaces (employers) incur a significant cost

<sup>1</sup>Department of Preventive Oncology, <sup>3</sup>Psychiatric Unit, Tata Memorial Hospital, Mumbai, <sup>2</sup>Healis, Sekhsaria Institute for Public Health, Navi-Mumbai, India \*For correspondence: drsharmilapatil@yahoo.com

with employees consuming tobacco at work, besides the direct impact on health of the employee. Also worksites have the potential to provide sustained peer group support and positive peer influence for quitting and staying tobacco free with the convenience of cessation opportunities and programmes on-site for the employee (Smedslund et al., 2004). The tobacco cessation efforts are compounded in a multiple ways in Indian settings where the smokeless forms of tobacco usage abound in diverse forms in multicultural urban settings, with a much wider spectrum of tobacco and health problems.

Proven individual cessation strategies include counseling and behavioral therapy (Fiore et al., 2000). Also the implementation of smoking cessation programmes in groups has been a popular method of delivering behavioural interventions (Cochrane, 2005). This study therefore assessed the effectiveness and impact of a three phase tobacco cessation intervention programme, combining individual and group therapy interventions at a confectionary factory worksite in Mumbai. We are reporting findings of this study in a series of two papers: paper-I (in this paper) mainly reports on baseline characteristics of study sample which includes oral cancer screening results, study design and in paper-II we report findings of actual intervention.

## Materials and Methods

### Participants

The present study was conducted in a confectionary factory located in Mumbai, India. All the 739 workers on payroll of the factory, across all divisions were invited to participate in the tobacco awareness programme. They were assessed for their tobacco usage through an interview using a structured questionnaire. Current tobacco users in any form were then invited to participate in the larger intervention study for tobacco use prevention and cessation program. All subjects were informed about the study and their written consent to participate in the program was obtained.

### Study Design and Intervention Methods

This is a single group study evaluating tobacco use prevention and cessation through a structured intervention program for tobacco users. The intervention program comprised of common information and education

on harmful effects of tobacco, benefits of tobacco cessation, individual counseling and group behavior therapy for tobacco cessation. Pharmacotherapy was not recommended to tobacco users at any stage of the program. The program was implemented by a team of Doctors, Medical Social Workers (MSW) and Clinical Psychologist. The team was trained in tobacco cessation counseling skills based on the stages of change model pioneered by Prochaska and Diclemente (Prochaska et al., 1983). The factory did not have a tobacco free policy nor designated areas for smoking or tobacco use at the beginning of the study.

Information on demographics, baseline tobacco use, attitudes and behaviors on tobacco consumption and personal medical details were obtained through a self administered questionnaire before clinical examination in the premises of the workplace. Nicotin dependency was assessed by the Fagerström score, for both smoking and smokeless forms of tobacco (Heatherton et al., 1991).

The multi-component program at the worksite was implemented in three stages: At the First Contact Program interaction with the workers, an elaborate common education program on harmful effects of tobacco use, tobacco use prevention and benefits of tobacco cessation, was conducted by using an audio visual presentation and poster exhibition. All participants were assessed for their tobacco usage prior to the intervention. The participants with history of current tobacco use in any form were then enrolled for the tobacco cessation programme with a proper informed consent. A structured questionnaire detailing information on sociodemographic variables with medical and other risk factors with complete assessment of their tobacco habit were entered by medical social workers. Oral cancer screening was also offered to all workers, tobacco users as well as non users as part of the tobacco control intervention program.

The tobacco users enlisted among all the factory workers were then invited to participate in the tobacco cessation intervention for individual counseling. Structured individual behavioral counseling by medical social workers for tobacco cessation lasting for fifteen to twenty minutes was undertaken. All participants were assessed for their tobacco use status at all interventions.

After three months of the first contact at Second Contact Programme tobacco cessation intervention session was conducted by MSW with groups of 10-15 tobacco users. This involved 30 minutes of group behavioral therapy for reinforcement of tobacco cessation advise. After three months of the second contact at Third Contact Programme the final intervention session was conducted. During which group behavioral therapy in groups of 10-15 tobacco users, lasting for 30-45 minutes duration was conducted by MSW along with a Clinical Psychologist. After twelve months of the first contact Final outcome measure, i.e., self reported tobacco abstinence was assessed.

Oral cancer screening: All the factory workers who participated in the tobacco awareness programme, were also invited for oral cancer screening.

Oral cancer (ICD C00-C06) has clinically recognizable precancerous lesions (leukoplakia, erythroplakia and oral

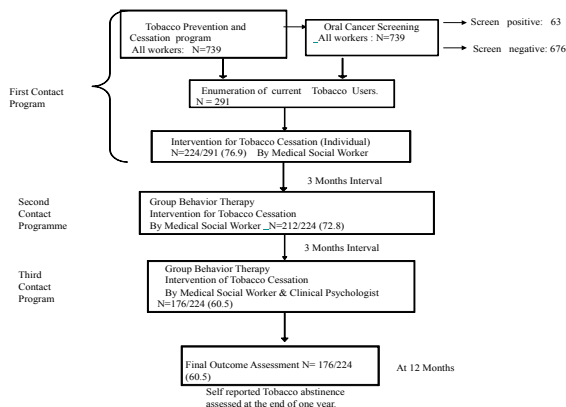


Figure 1. Study Design

submucous fibrosis) and asymptomatic early invasive lesions. The study protocol included a visual oral soft tissue examination and a questionnaire-based interview. Visual examination of the oral cavity is a simple approach used to detect asymptomatic oral cancers and precancerous lesions. The performance characteristics of this test are satisfactory in terms of sensitivity, specificity, and predictive value (Warnakulasuriya et al., 1984;1991; Mehta et al., 1986; Mathew et al., 1997), therefore, it is considered as a suitable screening test for oral cancer. Oral visual inspection of eligible subjects was performed with the help of a halogen flashlight by medical officer. All the intraoral sites were carefully examined and palpated. The neck was also palpated to detect enlarged lymph nodes.

The clinical findings were recorded as 1. Normal; 2. Benign or non cancerous lesions such as fissures in the tongue, aphthous ulcer, black patch, tobacco-related blanching, fibroma, hypertrophied papillae, etc.; and 3. Pre cancer lesions if found to have a white patch, ulcerated white patch, verrucous lesion, submucous fibrosis, red patch, suspicious ulcer or growth. All the above findings suspicious for oral precancer on screening evaluation were clinically confirmed by medical officers.

#### Statistical Analysis

Analyses were performed with SPSS 13.0 for Windows. To analyze the differences between tobacco users (oral lesions present) and non users (oral lesion absent), we used the chi-square test to determine differences in age groups, education, income groups, religion, gender, tobacco history of family members, alcohol use, personal medical history, marital status, and Fagerstrom score. Mean and standard deviation were also calculated for age of initiation, duration and frequency of various habits.

## Results

All the 739 workers on payroll of the factory, across all divisions within the factory were invited to participate in the Tobacco Prevention and Cessation Program designed for the factory workers. Out of 739 workers, 291 (39.4%) were found to be users of tobacco in some form at the baseline survey. Among the 291 tobacco users, 215(66.0%) were smokeless tobacco users while 50(17.2) were smokers and 49(16.8) were users of both smoked and smokeless forms of tobacco. Of the 215 smokeless users, 106 (36.4) were Khaini (Mixture of sun dried tobacco and slaked lime) users followed by 37 (12.7) Mawa (Pan betel leaf/Nut with tobacco), 24 (8.2) Pan betel leaf/Nut without tobacco, 17(5.8) Gutkha (pan masala with tobacco) and 8 (2.7) Masherri (roasted dried tobacco powder applied on teeth). Of the total workers 219(29.6%) reported consuming alcohol, of which 114 (52.1%) were consuming tobacco as well. Mean age for starting tobacco in any form was 27.9 years (ranges from 25.6 years for Masherri to 37.7 years for bidi smokers). The average duration of habit was 12.4 years (ranges from 6.6 for Gutkha to – 23.3 for Masherri) at an average frequency of 4 per day (ranges from 2.1 for Masherri to 5.3 for Bidi). (Table 1)

**Table 1. Distribution of the Various Forms of Tobacco Consumption and Mean Age of Initiation, Duration and Frequency of Tobacco Use**

	Total N = 291	%	Age of Initiation		Duration of Use Year		Freq. of use per day	
			Mean	SD	Mean	SD	Mean	SD
<b>Smoked Tobacco 50</b>								
Cigarette	47	16.1	27.4	9	14	9.4	3.7	3.3
Bidi	3	1	37.7	9	9	5.6	5.3	1.2
<b>Smokeless Tobacco 192</b>								
Khaini	106	36.4	28.1	8.6	11.3	8.5	4.2	1.4
Gutkha	17	5.8	27.5	6.1	6.6	6.4	5.1	4
Masherri	8	2.7	25.6	12.6	23.3	9.2	2.1	1
BQ with out Tab	24	8.2	30.7	9.2	8.7	8.5	3.2	1.3
Mawa	37	12.7	28.6	8.6	12.4	10.6	3.9	3
<b>Smoked and Smokeless Tobacco use</b>								
Combination	49	16.8	25.7	9.2	15.2	11	4.2	2.5

Overall Means: Age of Initiation, 27.86; Duration of Use Year, 12.35; Frequency of use per day, 4.00

**Table 2. Distribution of Demographic and Other Factors by Tobacco Use**

		Tobacco User	Tobacco Non User	"p-value, Chi-square"
		N = 291	N = 448	
Age Group	25-29	12	32	0.08, 9.9
	30-34	50	90	
	35-39	71	83	
	40-44	55	72	
	45-49	32	69	
Education	≥ 50	71	102	0.008, 13.9
	Nil	7	9	
	Primary	22	14	
	Secondary	212	309	
	≥Secondary	37	81	
Income Group	College	13	35	0.092, 0.8
	<5000	65	74	
	5001 -10000	216	347	
Religion	>10001	10	27	0.057, 3.6
	Hindu	278	412	
	Others	13	36	
Gender	Male	286	421	0.005, 7.9
	Female	5	27	
Marriage Status	Married	274	403	0.131, 4.1
	Unmarried	13	34	
	Widowed	4	11	
Tobacco use by Family Member	Yes	75	102	0.350, 0.9
	No	216	346	
Alcohol consumption	Yes	114	105	0.0001, 20.9
	No	177	343	
History of Chronic diseases	Yes	28	42	0.911, 0.01
	No	263	406	

Table 2 shows the baseline characteristics of tobacco users and non users among the factory workers. Education, gender, and alcohol use were factors which did seem to have an association with their tobacco use status. Although there were very few women in this factory (32/739), only 5 were tobacco users. Tobacco usage was more among workers with lower educational grades than the higher grades and alcohol users were more likely to

**Table 3. Distribution of Oral Pre Cancer Lesions by Demographic and Other Factors by Tobacco Use**

	Presence of clinical Oral Pre cancer Lesion		“p-value, Chi-square”	
	Yes (N = 63)	No (N = 676)		
Age Group	25-29	4	40	0.027, 12.7
	30-34	8	132	
	35-39	19	135	
	40-44	17	110	
	45-49	8	93	
Education	≥ 50	7	166	0.098, 7.8
	Nil	1	15	
	Primary	2	34	
	Secondary	53	468	
	≥Secondary	7	111	
Income Group	College	0	48	0.027, 7.2
	<5000	18	121	
	5001 -10000	45	517	
Religion	>10001	0	38	0.533, 0.4
	Hindu	60	630	
Gender	Others	3	46	0.077, 3.1
	Male	63	644	
Marriage Status	Female	0	32	0.434, 1.7
	Married	58	619	
	Unmarried	5	42	
Family Member	Widowed	0	15	0.519, 0.4
	Yes	13	164	
Alcohol consumption	No	50	512	0.0001, 28
	Yes	37	182	
History of Chronic diseases	No	26	494	0.007, 7.4
	Yes	12	58	
	No	51	618	
Tobacco Habits	Yes	63	228	0.0001, 106
	No	0	448	
“Combined use of Alcohol & or Tobacco”	Alcohol + Smoking	4	25	0.0001, 153
	Alcohol + Smokeless Tobacco	35	54	
	Only Alcohol	1	106	
	Smokeless Tobacco	27	125	
	Smoking	1	28	
	No Tobacco or Alcohol	1	344	
	The Variables below were assessed (N=291) only			
Fagerstorm score				
Low	41	160		
Form of Tobacco use*	Medium	12	49	0.018, 16.8
	High	10	19	
	Betal Quid with Tobacco	2	22	
Duration of Tobacco Use in yeas	Gutkha	7	10	0.113, 5.97
	Masheri	2	6	
	Khaini	26	80	
	Mawa	10	27	
	Combination	13	36	
	Cigarette	2	45	
	Bidi	1	2	
Frequency of Tobacco Use per day	<5	4	42	0.144, 3.9
	6-10	17	63	
	11-15	18	52	
	>15	24	71	
Frequency of Tobacco Use per day	≤ 3	19	99	0.144, 3.9
	4-6	38	115	
	≥7	6	14	

consume tobacco than the ones who did not. Age, income, religion, marital status, history of close family member using tobacco and personal medical history was not found to be associated with their own tobacco usage.

All the workers (739) were invited and screened for oral pre cancer lesions. Total 63 (8.5) workers were detected with clinical pre cancer lesion on oral visual inspection test and all were tobacco users of some form. Leucoplakia was detected among 34 (49.3) workers, followed by Sub mucous fibrosis among 22(31.9) workers. Erythroplakia with erythro-leucoplakia and non healing ulcers were also seen among 5(7.9) and 2(3.2) workers respectively.

While determining the factors affecting the distribution of clinical oral pre cancer lesions among worker population, it was seen that, among the socio demographic and other risk factors studied, age, alcohol consumption, personal medical history, the type of tobacco consumed, combination of alcohol with the type of tobacco consumed and tobacco use were found to be associated with presence of oral pre cancer lesions. Education, income, religion, duration and frequency of tobacco use as well as tobacco dependence in the form of fagerstrom scores were not associated with oral precancerous lesions (Table 3).

Highest prevalence of oral pre cancer lesions was observed in the age group of 35 to 45 years ( $p=0.027$ ). Individuals with other medical ailments seems to have significantly more oral pre cancer lesion than ones who did not have any significant medical history ( $p=0.007$ ). Alcohol users were also significantly more ( $p=0.000$ ) at risk of having oral pre cancer lesions. Within the category of various types of tobacco consumed, users of smokeless tobacco in the form of Gutkha (41.2%), Mawa (27%), Masheri (25%), Khaini (24.5%) and mixed users (both smoking and smokeless forms, 26.5%) showed increase prevalence of oral precancerous lesions ( $p<0.0001$ ). When various forms of tobacco use and alcohol use were combined it was observed that smokeless tob use along with alcohol intake had the highest prevalence of oral pre cancer lesions (39.1%) followed by only smokeless tobacco use (17.3%). Oral pre cancer lesions were absent among only smokers and only alcohol users. Since no clinical oral pre cancer lesions were detected among non tobacco users, tobacco use was clearly the risk factor associated with the lesions ( $p<0.0001$ ). (Table 3)

## Discussion

Tobacco as the risk factor for major chronic diseases like cancers, heart disease and chronic obstructive respiratory diseases have been extensively researched (Ministry of Health and Family Welfare 2001). India has one of the highest rates of oral cancer in the world, partly attributed to high prevalence of tobacco chewing (Vora et al., 2000). Considering the burden of chronic disease in India with tobacco being one of the major risk factors, there is an urgent need for tobacco control and prevention efforts targeted at the population levels.

The prevalence of tobacco use in any form among the workers in the confectionary factory was 39.4% comparable to the recent Global Adult Tobacco Survey



(GATS India 2009 -2010) finding of more than one-third (35%) of adults in India use tobacco. Smokeless tobacco users in its various forms comprised 73.9% of total tobacco users which is unique to tobacco consumption patterns with in our country was also true in this study (66%).

The mean age at initiation was 27.9 years in the present study for any form of tobacco is much later than reported in the recent GATS survey for India where the mean age at initiation was 17.9 years (GATS India 2009 -2010). The mean age at initiation being higher in our study may indicate that the habit was mostly acquired at workplace influenced by working peers, work pressures and shift working hours by day and night.

No major difference was found in the overall socio-demographic profile between the tobacco users and the nonusers. Among the socio demographic factors which influenced tobacco use among the study worker population was education, gender and alcohol usage. Two nationally representative health surveys had reported similar associations where tobacco consumption was significantly higher in poor, less or not educated, scheduled castes and scheduled tribe populations (Subramanian et al., 2004; Rani et al., 2003 ). Other recent Indian studies had also reported inverse association of educational status with tobacco use (Gupta 1996; Sorensen 2005; Gupta 2006). In the present study more males (40.5%) were found to be tobacco users than females (15.6%), which was similar to national health survey findings were 47% men and 14% of women reported to use tobacco in some form (Rani et al., 2003).

In this study, there were more alcohol consumers among the tobacco users (39.2%) than non tobacco users (23.4%). Studies have found that people who smoke are much more likely to drink, and people who drink are much more likely to smoke (Gupta et al., 2005). Concurrent tobacco and alcohol use are risk factors for oral, throat and esophageal cancers along with cardiovascular and thus poses a significant public health threat as is seen in many studies, was also reported recently from Mumbai (Pednekar et al., 2011). As per some western studies the risks of cancer of the mouth, throat, or esophagus for the smoking drinker are more than the sum of the risks posed by these drugs individually. (Patten et al., 1996 ) 28 Evidence suggests that compared with the risk for nonsmoking nondrinkers, the approximate relative risks for developing oral and throat cancer are 7 times greater for those who use tobacco, 6 times greater for those who use alcohol, and 38 times greater for those who use both tobacco and alcohol ( Blot 1992).

The prevalence of oral precancer lesions among tobacco users in our study was 21.6%. It is also important to note that in the present study no precancerous lesions were observed among non tobacco users, only smokers and only alcohol users, but combined use of tobacco (smoking and smokeless) with alcohol did show very significant association ( $p < 0.001$ ). Thus smokeless tobacco use with alcohol showed the highest prevalence (39.1%) of oral pre cancer lesions followed by smokeless tobacco use alone (17.3%) and alcohol and smoked tobacco (11.1%), amply demonstrating, the dangerous synergism of smokeless tobacco and alcohol, the combined use

of which predominates among the socioeconomically challenged communities where such health education and tobacco cessation efforts needs to be focused. These findings were consistent with results reported from Mumbai Cohort study which showed a direct association between greater consumption of alcohol use and increases risk of mortality from alcohol specific causes. In addition the study also demonstrated the synergistic interaction between alcohol and tobacco use in various forms on mortality (Pednekar et al., 2011).

Similar associations have been reported in a study from Taiwan which showed significant associations among leukoplakia ( $P < 0.01$ ), OSF ( $P < 0.0001$ ), and verrucous lesions ( $P < 0.0001$ ) and the life style of smoking, and alcohol drinking (Chung et al., 2005). Another study among alcohol users attending a rehabilitation center in south India, conducted to assess the prevalence of various oral mucosal lesions (OML) amongst whom 72% smoked tobacco reported a total of 25% alcohol users having at least one OML (Rooban et al., 2009 ).

In an oral cancer screening study in India, tobacco chewing was the most important risk factor for multiple oral premalignant lesions but smoking was not associated with the risk of multiple oral premalignant lesions (Thomas et al., 2003). Considering the fact that the present study showed significantly more oral pre cancer lesion among individuals with other medical ailments, amply demonstrates that tobacco and alcohol users in general are at greater risk for many major chronic diseases.

India has one of the highest rates of oral cancer in the world, partly attributed to high prevalence of tobacco chewing (Dixit et al., 2000; Mathers et al., 2006). In spite of the high prevalence of tobacco consumption and the huge burden of oral cancers, population based programs for awareness about prevention of tobacco use and oral cancer screening is nonexistent in India. Also there is still limited awareness among health care professionals like dentists, family physicians or doctors at primary care level to counsel tobacco users accessing their services or conduct simple oral visual inspection during their routine clinical practice to detect oral pre malignant lesions early. Oral cancer screening, even when planned at community levels in general by inviting people to the screening centers, may however not accomplish the desired purpose since those ( especially the high risk group) who work during the day may not visit screening centers. Worksite adoption of tobacco prevention and control initiatives gives an opportunity to overcome these challenges. Workplaces due to its confined workforce offers opportunities to reach out to large groups for delivering the above activities which requires regular follow up and multiple contacts with those at risk, to ensure an effective programme. One such study conducted to assess the feasibility of a screening program to detect potentially pre-malignant oral disorders in a workplace in India, by visual inspection concluded that it is not only feasible but also effective (Wamakulasuriya et al., 2010).

In conclusion, an integrated approach, a first of its kind to address tobacco use prevention with oral cancer screening and tobacco cessation services for tobacco users in an urban factory work place settings was highly

effective in methodically dealing with the problem of tobacco consumption among the factory workers with high prevalence of oral pre malignant lesions. The study demonstrated a good acceptance and participation by the workers in the tobacco control initiative at the workplace. The employers favored the initiative as positive for the overall health benefits to the workers in general and the momentum gained due to the program for an effective tobacco free policy for the company.

Tobacco remains one of the most important preventable causes of addiction, sickness and mortality in the world. Comprehensive and sustainable tobacco use prevention and control activities such as these if can be integrated and inbuilt with in the existing work place medical services can go a long way in bringing down the burden of several preventable chronic diseases related to tobacco consumption and the subsequent medical cost to the companies.

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