

TOBACCO CONSUMPTION PRACTICES AND RISK OF ORO-PHARYNGEAL CANCER: A CASE-CONTROL STUDY IN CENTRAL INDIA

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Abstract. A hospital based, group matched case control study was conducted with the objective to assess the association between tobacco consumption practices and risk of development of oro-pharyngeal cancer in Central India. The study included 123 cases of oro-pharyngeal cancer, diagnosed on the basis of histopathology at three tertiary care centers in Nagpur city. Each case was matched for age and sex with two hospital controls: one selected from non-cancer patients and another from patients having cancer of other sites. Tobacco chewing (OR=7.98, 95% CI 4.11-13.58) and tobacco smoking (OR=2.25, 95% CI 1.22-3.70) were found to be significantly associated with oro-pharyngeal cancer on unconditional multiple logistic regression analysis. Further analysis revealed a dose-response relationship between increasing frequency, duration and retention time of tobacco in mouth and risk of oro-pharyngeal cancer. Other risk factors which were also found to contribute significantly in the outcome of oro-pharyngeal cancer in the study population were: use of traditional /local substances (eg pan, betel nut, lime) with or without tobacco, use of tobacco containing material for teeth cleaning, type of smoking (eg bidi, chillum, cigarette) and outdoor occupations. High values of estimates of attributable risk percent (ARP) and population attributable risk percent (PARP) confirmed the positive impact of reduction or elimination of the tobacco consumption practices on reducing the risk of oro-pharyngeal cancer in the population of Central India.

INTRODUCTION

Oro-pharyngeal cancer is one of the leading cancers in South and Southeast Asia. In Bangladesh, India, Pakistan and Sri Lanka, it is the most common and accounts for about a third of all cancers (WHO, 1984). Approximately 90% of oro-pharyngeal cancers in this region have been attributed to the habit of tobacco chewing and smoking. Although tobacco consumption in various forms has been implicated as a significant cause of oro-pharyngeal cancer, studies assessing role of tobacco in causation of oro-pharyngeal cancer have not been reported from Central India. Considering the remarkable variations in tobacco consumption practices among different population groups and geographical areas, there is a need to explore the relationship between tobacco consumption and risk of oro-pharyngeal cancer in population where such assessment has not been done earlier (WHO, 1984).

Additionally, alcohol intake, occupation, socio-economic status, consumption of traditional/local chewing substances (like pan, betel nut, lime) and alcohol containing mouth washes are also recognized as risk factors for development of oro-pharyngeal cancer (Mashberg *et al*, 1993; Jussawalla, 1971; Shapiro, 1996; Brugere, 1986; Kabat, 1989). Studies are available on the relationship of above stated risk factors and risk of oro-pharyngeal cancer. However risk of these factors in combination with various tobacco consumption practices has not been evaluated by using multivariate analysis. With this background and fortified by the fact that risk factors of oro-pharyngeal cancer are not evaluated in multivariate environment in Central India, we have performed a hospital based, group matched case-control study of oro-pharyngeal cancer and hypothesized risk factors.

MATERIALS AND METHODS

The present study was carried out at three tertiary care centers in Nagpur city: Government Medical College Hospital, Government Dental College

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and Rashtra Sant Tukdoji Cancer Hospital. The study was designed as a hospital based, group matched case-control study. Study consisted of 123 cases oro-pharyngeal cancer. The diagnosis of cases was based on clinical histo-pathological and radiological findings. All newly diagnosed cases of oro-pharyngeal cancer confirmed by histo-pathological examination were included in the study. Each case was group matched for age and pair matched for sex with two hospital controls. One control was selected from non-cancer patient and another from patients having cancer of other sites.

The present study included tobacco chewing (frequency, duration, retention time of chewing material in mouth) with or without consumption of traditional/local chewing substances (like pan, betel nut, lime), tobacco smoking (frequency, duration, type), use of tobacco containing material for teeth cleaning, alcohol intake and occupation as risk factors. Measurement of exposure has been described in Table 2.

Statistical analysis

Univariate analysis included Pearson's chi-square and odds ratios. 95% confidence intervals (Cis) for odds ratios were built by using methods described by Greenberg and Ibrahim (1985). Full model of unconditional logistic regression analysis included all risk factors incorporated in this study. The level of significance (α) was fixed at 0.05

level in the full model. Final model included only significant factors identified in the full model. Attributable risk proportion (ARP) and population attributable risk proportion (PARP) along with their 95% confidence intervals were calculated for the significant risk factors. STATA (version 5.0), a statistical software and EpiTab procedures were used to obtain estimates of odds ratio, attributable risk proportion, population attributable risk proportion and their 95% confidence intervals in univariate and multivariate analysis.

RESULTS

Table 1 shows matching characteristics of study subjects. It is evident from the table that majority of subjects were males and belong to 41-50 years and 51-60 years age groups. Table 2 depicts distribution of study subjects according to risk factors. This table also shows classification scheme and measurement strategy for various risk factors included in the study. Univariate analysis of risk factors of oro-pharyngeal cancer is described in Table 3. Except alcohol intake, at least one stratum of other risk factors was found to be statistically significant.

Table 4 describes multivariate analysis of major risk factors for oro-pharyngeal cancer. The full model of unconditional logistic regression analysis included tobacco chewing, tobacco smoking, alco-

Table 1

Matching characteristics of study subjects.

Factor	Cases n=123 (%)	Conrol 1 n=123 (%)	Control 2 n=123 (%)
Age (years)			
21-30	4 (3.25)	3 (2.44)	4 (3.25)
31-40	16 (13.01)	17 (13.82)	19 (15.44)
41-50	49 (39.84)	48 (39.03)	48 (39.03)
51-60	34 (27.64)	31 (25.20)	30 (24.39)
Above 60	20 (16.26)	24 (19.51)	22 (17.89)
Sex			
Male	73 (59.35)	73 (59.35)	73 (59.35)
Female	50 (40.65)	50 (40.65)	50 (40.65)

Table 2

Distribution of study subjects according to risk factors.

Risk factors	Cases n=123 (%)	Control 1 n=123 (%)	Control 2 n=123 (%)
Tobacco consumption practises			
Tobacco chewers	90 (73.2)	32 (26.0)	29 (23.6)
Nonchewers	33 (26.8)	91 (74.0)	94 (76.4)
Use of traditional / local chewing substances with or without tobacco			
Tobacco	24 (19.5)	7 (5.7)	4 (3.3)
Betel nut	5 (4.1)	9 (7.3)	5 (4.1)
Tobacco + betel nut	14 (11.4)	4 (3.3)	6 (4.9)
Pan + betel nut	7 (5.7)	12 (9.8)	6 (4.9)
Pan + betel nut + tobacco	52 (42.3)	21 (17.1)	19 (15.4)
Non chewers	21 (17.1)	70 (56.9)	83 (87.5)
Frequency of tobacco chewing			
1-2 times	4 (3.3)	8 (6.5)	5 (4.1)
3-5 times	10 (8.1)	11 (8.9)	12 (9.8)
6-10 times	19 (15.4)	6 (4.9)	7 (5.7)
More than 10 times	25 (20.3)	4 (3.3)	3 (2.4)
Retaining quid overnight	32 (26.1)	3 (2.4)	2 (1.6)
Non chewers	33 (26.8)	91 (74.09)	94 (76.4)
Duration of tobacco chewing			
<20 years	7 (5.7)	10 (8.1)	8 (6.5)
20-40 years	57 (46.3)	11 (8.9)	13 (10.6)
>40 years	26 (21.1)	10 (8.1)	8 (6.5)
Non chewers	33 (26.8)	91 (74.0)	94 (76.4)
Retention time of tobacco in mouth			
<30 minutes	11 (8.9)	13 (10.6)	11 (8.5)
30-60 minutes	25 (20.3)	14 (11.4)	14 (11.4)
>60 minutes	54 (43.9)	5 (4.1)	4 (3.3)
Non chewers	33 (26.8)	91 (74.0)	94 (76.4)
Tobacco smoking			
Smokers	51 (41.5)	29 (23.6)	32 (26.0)
Non smokers	72 (58.5)	94 (76.4)	91 (74.0)
Types of smoking habit			
Cigarette	5 (4.1)	8 (6.5)	8 (6.5)
Bidi and / or chillum	40 (32.5)	10 (8.1)	21 (7.1)
Bidi and cigarette	6 (4.9)	17 (13.8)	3 (2.4)
Non smokers	72 (58.5)	21 (17.1)	91 (74.0)
Frequency of smoking (per day)			
< 10 times	17 (13.8)	14 (11.4)	14 (11.4)
≥ 10 times	34 (27.7)	15 (12.2)	18 (14.6)
Non smokers	72 (58.5)	94 (76.4)	91 (74.0)
Duration of smoking			
<20 years	16 (13.0)	9 (7.3)	10 (8.1)
20-40 years	27 (21.9)	16 (13.0)	18 (14.6)
>40 years	8 (6.5)	4 (3.3)	4 (3.3)
Non smokers	72 (58.5)	94 (76.4)	91 (74.0)
Alcohol intake			
Regular drinkers	14 (11.4)	10 (8.1)	9 (7.3)
Non drinkers and occasional drinkers	109 (88.6)	113 (91.8)	114 (92.7)
Use of tobacco containing material for teeth cleaning			
Tobacco containing material	33 (26.8)	10 (8.1)	5 (4.1)
Non tobacco containing material	90 (73.2)	113 (91.9)	118 (93.9)
Occupation			
Outdoor	93 (75.6)	76 (61.8)	73 (59.3)
Indoor	30 (24.4)	47 (38.2)	50 (40.7)

hol intake and occupation. Of these factors, except alcohol intake, other 3 factors were recognized to be significant. The final model, excluded alcohol intake, endorsed their significance. In the order of magnitude of risk, tobacco chewing was leading with OR=7.98 (95% CI 4.11-13.58) followed by

tobacco smoking (OR=2.25, 95% CI 1.22-3.70) and occupation (OR=2.01, 95% CI 1.11-3.52).

Table 5 shows subgroup analysis of tobacco consumption practices and risk of oro-pharyngeal cancer. All the eight tobacco consumption prac-

Table 3

Univariate analysis of risk factors for oro-pharyngeal cancer.

Risk factor	Chi-square	df	p-values	Control 1		Control 2		Control 1 +Control 2	
				OR	95% CI	OR	95%CI	OR	95% CI
Tobacco chewing	79.4	1	0.0001	7.76	4.41-13.65	8.84	4.97-15.70	8.27	5.06-13.51
Use of traditional / local chewing substances with or without tobacco									
Tobacco	55.06	1	0.0001	11.43	4.39-29.63	23.71	7.68-72.37	15.90	6.88-36.71
Betel nut	2.98	1	0.0842	1.85	0.59-5.91	4.60	1.11-14.07	2.60	0.89-7.71
Tobacco + betel nut	31.02	1	0.0001	11.67	3.60-37.33	9.22	3.24-26.10	10.20	4.08-25.50
Pan + Betel nut	4.59	1	0.0322	1.94	0.70-5.45	4.61	1.46-14.58	2.83	1.09-7.44
Tobacco + pan + betel nut	59.72	1	0.0001	8.25	4.10-16.61	10.82	5.33-21.94	9.47	5.14-17.45
Use of tobacco containing material for teeth cleaning	31.15	1	0.0001	4.14	1.96-8.74	8.65	3.34-22.29	5.65	2.95-10.80
Frequency of tobacco chewing									
1-2 times	0.84	1	0.0360	1.38	0.41-4.63	2.28	0.62-8.37	1.72	0.56-5.37
3-5 times	4.64	1	0.0312	2.51	1.00-6.33	2.37	0.96-5.90	2.44	1.08-5.52
6-10 times	33.15	1	0.0001	8.73	3.29-23.08	7.73	3.04-19.59	8.19	3.73-17.99
>10 times	62.13	1	0.0001	17.23	5.79-50.85	23.74	7.10-78.43	20.02	8.15-48.98
Retaining quid overnight	84.78	1	0.0001	29.41	8.91-96.09	45.58	11.36-354.06	35.88	13.38-95.53
Duration of tobacco chewing									
<20 years	1.53	1	0.2165	1.93	0.71-5.34	2.49	0.87-7.17	1.78	0.72-4.42
20-40 years	83.89	1	0.0001	13.10	6.30-27.20	12.49	6.11-25.5	12.78	7.04-23.20
>40 years	40.54	1	0.0001	7.17	3.16-16.25	9.26	3.87-22.07	8.10	4.02-16.31
Retention time of tobacco in mouth									
<30 min	5.57	1	0.0183	2.33	0.97-5.63	2.85	1.15-7.06	2.57	1.17-5.68
30-60 min	26.01	1	0.0001	4.92	2.31-10.51	5.09	2.38-10.84	5.01	2.61-9.59
>60 min	113.9	1	0.0001	29.78	11.25-78.33	30.76	11.63-80.86	33.64	15.32-73.64
Tobacco smoking	2.15	1	0.0010	2.30	1.33-3.97	2.01	1.18-3.45	2.15	1.36-3.40
Type of smoking									
Cigarette	0.42	1	0.5184	0.65	0.22-1.91	0.79	0.26-2.40	0.71	0.27-1.93
Bidi and/or chillum	14.55	1	0.0001	3.07	1.62-5.82	2.41	1.31-4.42	2.70	1.61-4.54
Bidi and cigarette	3.60	1	0.0578	3.92	0.10-39.20	2.53	0.21-30.52	3.08	0.62-15.25
Frequency of smoking (per day)									
< 10 times	1.76	1	0.1851	1.59	0.74-3.39	1.53	0.72-3.28	1.56	0.81-3.00
≥ 10 times	12.47	1	0.0004	2.96	1.51-5.80	2.39	1.25-4.54	2.65	1.53-4.58
Duration of smoking									
<20 years	4.58	1	0.0323	2.32	0.98-5.45	2.02	0.88-4.64	2.16	1.07-4.40
20-40 years	6.07	1	0.0138	2.20	1.11-4.36	1.90	0.97-3.69	2.04	1.15-3.61
>40 years	3.51	1	0.0609	2.61	0.80-8.47	2.53	0.77-8.21	2.57	0.96-6.88
Alcohol intake	1.35	1	0.2457	1.45	0.63-3.34	1.63	0.69-3.83	1.53	0.75-3.14
Occupation	8.22	1	0.0041	1.92	1.11-3.31	2.12	1.23-3.66	2.02	1.25-3.21

tices in this model were to be significantly associated with oro-pharyngeal cancer. In particular, estimates of adjusted odds ratios were high for use of traditional/local chewing substances with tobacco (OR=9.03, 95% CI 4.58-15.17), retention time of tobacco in mouth (OR=8.86, 95% CI 4.94-11.74), frequency of tobacco chewing (OR = 7.76, 95% CI 3.84-12.16), duration of tobacco chewing (OR=7.51, 95% CI 3.54-16.19), and use of tobacco containing material for teeth cleaning (OR=5.19, 95% CI 2.46-11.84).

Table 6 elaborates point estimates of attributable risk proportion, population attributable risk proportion and their 95% confidence limits for significant risk factors. The attributable risk proportion which defines the proportion of total disease in risk in exposed persons that may be attributed to their exposure (risk factor) was very high for tobacco chewing and other tobacco consumption practices, thereby confirming the etiological role of these factors in the outcome of oro-pharyngeal cancer. Similarly, the population attributable risk

Table 4

Multivariate analysis of major risk factors for oro-pharyngeal cancer.

Risk factors	OR	95% CI	p-values
Full model			
Tobacco chewing	8.01	4.92-14.76	0.0001
Tobacco smoking	2.18	1.19-3.56	0.0152
Use of tobacco containing material for teeth cleaning	5.19	2.46-11.84	0.0001
Alcohol intake	1.84	0.88-2.87	0.0838
Occupation	2.16	1.31-3.74	0.0156
Final model			
Tobacco chewing	7.98	4.11-13.58	0.0001
Tobacco smoking	2.25	1.22-3.70	0.0111
Occupation	2.01	1.11-3.52	0.0129

Table 5

Subset (multivariate) analysis of tobacco consumption practices and risk of oro-pharyngeal cancer.

Risk factors	OR	95% CI	p-values
Tobacco consumption with traditional/local chewing substances	9.03	4.58-15.17	0.0001
Use of tobacco containing material for teeth cleaning	5.19	2.46-11.84	0.0001
Frequency of tobacco chewing	7.76	3.84-12.16	0.0001
Duration of tobacco chewing	7.51	3.54-16.19	0.0001
Retention time of tobacco in mouth	8.86	4.94-11.74	0.0001
Type of smoking	2.16	1.11-4.57	0.0151
Frequency of smoking	2.43	1.08-4.04	0.0138
Duration of smoking	2.09	1.07-3.71	0.0167

Table 6

Attributable risk proportion (ARP) and population attributable risk proportion (PARP) for significant risk factors for oro-pharyngeal cancer.

Risk factors	ARP	95% CI	PARP	95% CI
Tobacco chewing	0.87	0.76-0.93	0.64	0.44-0.76
Tobacco smoking	0.55	0.18-0.73	0.24	0.05-0.04
Use of traditional/local chewing substances with tobacco	0.89	0.78-0.93	0.67	0.47-0.78
Use of tobacco containing material for teeth cleaning	0.81	0.59-0.92	0.20	0.08-0.39
Frequency of tobacco chewing	0.87	0.74-0.92	0.63	0.42-0.74
Duration of tobacco chewing	0.87	0.72-0.94	0.62	0.39-0.79
Retention time of tobacco in mouth	0.89	0.80-0.91	0.66	0.50-0.73
Type of smoking	0.54	0.10-0.78	0.22	0.03-0.47
Frequency of smoking	0.59	0.07-0.75	0.26	0.02-0.43
Duration of smoking	0.52	0.07-0.73	0.21	0.02-0.40
Occupation	0.50	0.10-0.72	0.38	0.06-0.61

proportion, which corresponds to the proportion of disease risk in all persons that may be attributed to the exposure under investigation, was also high for these variables.

DISCUSSION

The incidence rate of oro-pharyngeal cancer varies widely from one country to another and from region to region within countries (WHO, 1984). The highest rates are reached among the peoples of South and Southeast Asia (eg in Bangladesh, Myanmar, Cambodia, India, Malaysia, Nepal, Pakistan, Singapore, Sri Lanka, Thailand and Vietnam), where habit of chewing tobacco is common (WHO, 1984). There is excellent evidence from many sources that in developing countries the chewing of tobacco is by far the most important cause of oral cancer. Findings of this study also identified role of various tobacco consumption practices and dose and duration response relationship in the outcome of oro-pharyngeal cancer. The evidence about the carcinogenic effect of tobacco use is clear-cut. Not only is there a high correlation between tobacco chewing habits and the incidence of oral cancer in different regions, but also the results from numerous prospective (WHO, 1984) and case con-

trol studies (Hirayama, 1966) in areas where tobacco chewing is popular indicate that (i) virtually every case of oral cancer occurs in persons who used tobacco, and (ii) people who chew tobacco have a greatly elevated risk of developing oro-pharyngeal cancer. The case against tobacco is further strengthened by the findings that the cancers almost always occur on the side of the mouth where the tobacco quid was kept, and the probability of developing oro-pharyngeal cancer is directly correlated with the duration and intensity of such use. This may be the reason why all tobacco consumption practices included in this study were highly significant on unconditional logistic regression analysis.

Tobacco consumption with traditional/betel chewing substances has shown maximum risk of development of oro-pharyngeal cancer in this study. In Central Indian populations the common form of tobacco chewing is the betel quid, which usually consists of the leaf of the betel vine (piper betle), areca nut, lime and tobacco. The composition and the method of use of quids and other forms of tobacco use vary from region to region. In India, flex of sun dried tobacco are usually mixed with powered or sliced, dried betel nut and slaked (stone or shell) lime, the whole being wrapped in a betel leaf on which catechu and aqueous extract of the heartwood of the *Acacia Catechu* or *Acacia Suma*

has been smoked. Hirayama (1966) has reported relative risk of oral cancer in people with various tobacco habits from India and Sri Lanka. Although there is variation in the estimates of relative risk, tobacco consumption with traditional /local chewing substances have been importantly attributed in the etiology of oro-pharyngeal cancer.

Traditionally various substances are used for cleaning of teeth by Indian population. Few of these substances like burnt tobacco and snuff contains tobacco. Regular use of these substances for teeth cleaning can certainly increase risk of oro-pharyngeal cancer (Wahi, 1969). Higher point estimates of odds ratios for frequency of tobacco chewing (OR=7.76, 95% CI 3.84-12.16) and duration of tobacco chewing (OR=7.51, 95% CI 3.54-16.19) indicated significant dose and duration response relationship of tobacco consumption and oro-pharyngeal cancer. Longer retention time of tobacco chewing material in mouth was significant risk factor in this study. Wahi (1969) earlier reported that the longer the duration of retention of chewing quid in mouth the higher the rate of oral cancer. If the quid was chewed for more than 30 minutes the risk appeared to be 15 times higher for chewer than non-chewer and 3 times higher than for the chewers of 1 to 10 minutes duration. The risk of oral cancer was found to be 36 times higher than for non chewer if the quid was kept in mouth during sleep, and about 6 times higher than that for daytime tobacco chewers only. The results of this analysis on tobacco smoking are consistent with those of previous analyses. The strength of the association between oro-pharyngeal cancer and tobacco smoking found in this study falls within the range of the results of the previous studies (Jassawalla, 1971; Mashberg, 1993; Marshall, 1992; Franceschi, 1990). Further analysis revealed dose and duration response relationship of smoking and risk of oro-pharyngeal cancer. Furthermore, the risk was higher among bidi and chillum smokers as compared to cigarette smokers. Data from certain parts of the developed world indicate that oro-pharyngeal cancer can also be caused by concentrations of alcohol, and alcohol appears to have a synergistic effect on the risk of oro-pharyngeal cancer in tobacco users (Mashberg, 1993; Blot, 1988; Franco, 1989; Zheng, 1990). However, in this study we could not find any significant association between alcohol and oro-pharyngeal cancer on univariate analysis. Although point estimates of odds ratios increased from 1.53 to 1.84 and its 95% CI also got narrowed in full model of unconditional logistic regression, still it was non significant. This

result indicated synergistic effect and interaction of alcohol intake and tobacco consumption in the outcome of oro-pharyngeal cancer, the finding which has been endorsed earlier also.

Outdoor occupations are considered to be one of the important factors associated with risk of oro-pharyngeal cancer. Jussawala (1982) stated that farmers and sailors chronically exposed to light for long hours are at higher risk of acquiring cancer of the lip. Leske *et al* (1980) mentioned that prolonged exposure to an ultraviolet light is an additional etiological factor in lip cancer. Males engaged in outdoor occupations such as farming and fishing are at increased risks. Agricultural labor is an outdoor occupation and the proportion of agricultural laborers is also high in this study. This may be the reason for significant association between outdoor occupation and oro-pharyngeal cancer identified in this study.

Although current study recognized significance of majority of factors contributing to the outcome of oro-pharyngeal cancer in the Central India population, the study design used is a retrospective one, *ie* case-control study. This design has inherent limitations due to its susceptibility to various biases (Schlesselman, 1982). However for quicker risk factor evaluation this is the recommended method. The attempt was made during the planning, conduct and analysis phases of the study to control for biases. Additionally, for assessment of risk factors, a stepwise multivariate analysis approach was followed. In the first step of this analysis, only four independent variables namely tobacco chewing, tobacco smoking, alcohol intake and occupation were included in the full model. However final model excluded alcohol intake, which was non significant in the earlier model. In the next step, various practices and characteristics of tobacco chewing and tobacco smoking were included in the logistic regression model. This two stage analysis approach has not only helped in identifying the significance of major risk factors, but it also helped in revealing further role of various characteristics (*eg* frequency of tobacco chewing, duration of tobacco chewing, frequency of tobacco smoking, duration of tobacco smoking etc) of the earlier identified risk factors.

Although current case referent study identified significant role of various tobacco consumption practices in the etiology of oro-pharyngeal cancer, which is very a well known fact, this is a first ever

conducted case-control study in Central India. The importance of conducting this study is in concordance with the recommendations of World Health Organization which emphasized that studies should be carried out on the prevalence and relative risks of different forms of quids and tobacco habits (WHO, 1984). Moreover and World Health Organization has already recommended such studies in countries and population groups where information on tobacco consumption habits in relation to oro-pharyngeal cancer is not available.

Almost all the factors included in this study are modifiable risk factors and effective intervention by adopting primary prevention strategies can certainly help in bringing down the incidence of oro-pharyngeal cancer. Primary prevention strategy for oro-pharyngeal cancer should focus upon modifying habits associated with the use of tobacco (WHO, 1984). There are three major ways to modify these habits and prevent oral cancers:

- 1) encourage people never to adopt any tobacco habit.
- 2) encourage people who already use tobacco to stop.
- 3) encourage people who already use tobacco and cannot stop to at least decrease their use, or to modify behavior in other ways to reduce the risk of cancers.

There is excellent evidence that the risk of oral cancer is dramatically lower in people who never adopt any tobacco habit; this evidence is judged strong enough to justify, and indeed to compel, the implementation of carefully planned programs, to decrease the adoption of tobacco using habits. It has been also shown that primary prevention programs can significantly reduce the tobacco habits and the regression rate of leukoplakia was higher among those who stopped or reduced their tobacco consumption. Considering the fact that estimates of attributable risk proportion and population attributable risk proportion suggested positive impact of tobacco consumption practices on reducing risk of oro-pharyngeal cancer in the population of Central India, need for effective primary risk factor intervention strategy is emphasized.

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