



A Hospital Based Case Control Study on Oral Cancer: K.M.I.O (Regional Cancer Center) Experience

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Abstract

Background of the Study: Oral cancer is estimated to be 16th most common cancer for both sexes and the third most common cancer in developing nations. In India, Oral cancer is found to be 2nd leading site in males (10.1/100,000 persons) and 4th leading site in females (4.3/100,000 persons, hence there is an urgent and intense need to study its health consequences in general population and particularly, the risk of development of oral cancer necessitates taking up epidemiological case-control study to identify risk factors for Oral cancer.

Methodology: All cases reporting to Kidwai Memorial Institute of Oncology (KMIO), clinically diagnosed and microscopically confirmed cases were only included. Those diagnosed through X-ray and others imaging techniques are excluded from the study. Smokers often start with bidi, shift to cigarette or vice versa. Similarly, with tobacco chewing and alcohol usage in the above study, the patients who used for long duration (> 1year) are retained. Separate groups were made to analyze the data to find out association of different habits. The direct personal interview of the Cases and Controls was carried out from January 2015 to June 2018. A total of 370 microscopically confirmed Oral cancer cases and 370 healthy individuals were interviewed during a four-year period, on an average 2 to 3 per working day.

Results: The Income status and education status were strongest association with Oral cancer among demographic factors, even after adjusting for the effect of smoking, chewing and alcohol consumption. Ever smokers showed 2.5-fold (95% CI 1.6342, 4.026) oral cancer risk without adjusting any other probable risk factors. After adjusting for chewing tobacco and alcohol, the risk increased to 3.4-fold (95% CI 1.371, 8.475) the analysis was not carried out for female group due to very less ever smokers in women. The risk in ever beedi smoker after adjusting (chewing and alcohol), the OR was 3.1. (CI 95% 1.239, 7.970). Ever smokers of both (Cigarette and Beedi) 4.0-fold (95% CI 1.6271, 10.2810) compared to never smokers of both habits.

Ever chewing group showed 7.4 folds higher risk of Oral cancer compared to never chewer group (95% CI

4.8523, 11.3062) after adjusting with smoking and alcohol. In males, ever chewers showed 6.7 folds oral cancer risk after adjusting for smoking and alcohol. For males, alcoholic ever users, OR is 0.4 (95% CI, 0.104, 1.142). The OR was not found to be significant for wine and beer users. For ever hot drink users, OR (4.0) was found to be significant (95% CI 2.437, 6.44) with 95% confidence interval.

Conclusions: The present study indicates that exposure to smoking in any form, either by Cigarette or Beedi increases the chances of developing oral cancer. The association between Beedi smoking and oral cancer is found to be statistically significant after adjusting cigarette, chewing and alcohol. Beedi smoking exhibited higher risk of getting Oral cancer compared to cigarette smoking.

A significantly increased risk for Oral cancer was seen by chewing tobacco in males and females. Chewing tobacco is significantly and independently associated with an increased risk of squamous-cell carcinoma of the oral cavity. Synergistic risk (combined effect) of all the above products on Oral cancer was observed.

Keywords: Oral cancer, Cigarette smoking, Tobacco chewing, Cancer Registry, Odds ratio.

Introduction

The Oral cavity is usually defined to include the anterior two thirds of the Tongue, the upper and lower gums, Lips, Buccal mucosa, Floor of the mouth, Hard palate and Retromolar trigone. The Oropharynx includes Soft palate, Base of the tongue, Vallecula, Epiglottis and the Tonsils. Worldwide, Oral cancer is estimated to be 16th most common cancer for both sexes and the third most common in developing nations. In developing countries, oral cancer being 10th leading site while considering both sexes with individual perspective in men 7th common cancer and in women 16th leading site.

In India, Oral cancer is found to be second leading site in males (10.1/100,000 persons) and 4th leading site in females (4.3/100,000 persons)^[1]. Oral cancer is the most common cancer, hence there is an urgent and intense need to study its health consequences in general and in particular any risk of development of oral cancer which necessitates to take epidemiological case-control study to identify risk factors for oral cancer.

About 80% of people with oral cavity and Oropharyngeal cancers use tobacco in the form of cigarettes, chewing tobacco or snuff. About 70% of people diagnosed with oral cancer are heavy drinkers^[2].

In Kidwai, Hospital Based Cancer Registry, the proportion of mouth cancer in both the sex is almost same which shows very distinguished pattern, compared to other hospital-based cancer registries. Hence this study is conducted to know the risk factors for the same.

Material and Methodology

At KMIO, each and every patient registered will be interviewed at their first presentation to the hospital and socio-demographic details will be collected in the first stage. Later, the case records of these patients are obtained to the registry to extract information on clinical variables such as method of diagnosis, stage of the disease, site of cancer, treatment details, etc. The Risk factors are collected during the subsequent visit to the Institute.

For present study, microscopically confirmed cases were included. The clinically diagnosed and those diagnosed through X-ray and others imaging techniques are excluded from the study. The interview was not conducted on general holidays and patients who were already treated outside. The patients who come to Regional Institute for palliative care were excluded. Further, patients with advance disease and age more than 80 years, who were unable to talk or express were also excluded from the study. The interview of the Cases and Controls was carried out from January 2015 to June 2018. A total of 370 microscopically confirmed Oral cancer cases and 370 healthy individuals were interviewed during a four-year period, on an average 2 to 3 per working day.

Smokers often start with bidi, shift to cigarette or vice versa. Similarly, with tobacco chewing and alcohol habit in the above case, the long duration (> 1year) are retained. Suppose both the habits are from long duration, then separate groups were made to analyze the data to find out association.

Matched Case Control Study

Matching in a case-control study does not control for confounding by the matching factors. In fact, it can introduce confounding by the matching factors even when it did not exist in the source population. Thus, a matched design may require controlling for the matching factors in the analysis. However, it is not the case that a matched design requires a matched analysis. Provided that there are no problems of sparse data, control for the matching factors can be obtained, with no loss of validity and a possible increase in precision, using a “standard” (unconditional) analysis and a “matched” (conditional) analysis may not be required or appropriate^[3].

Sample Size Calculation for Case Control Study:

$$n = \left(\frac{r + 1}{r} \right) \frac{\sigma^2 (Z_{\beta} + Z_{\alpha/2})^2}{(\text{difference})^2}$$

For 80% power, $Z = .84$, For 0.05 significance level, $Z = 1.96$, $r = 1$ (equal number of cases and controls) $\sigma^2 = 10.0$, Difference = 5.0.

The sample size was calculated using the above formula, the sample size calculated by considering 80% power and with assuming odds ratio between case and control two folds based on pilot study conducted, 95% confidence level was considered for sample size calculation. Based on analysis, we needed atleast a sample size of 600 numbers. 300 sample size in each arm to undertake the above study.

Statistical Analysis

Statistical analysis was done by using R-Software. Odds ratios was used to compare the relative odds of the occurrence of the outcome of interest (e.g. disease or disorder), given exposure to the variable of interest (e.g. health characteristic, aspect of medical history).

Results

The number of illiterates were larger among cases (63.2%) than in control (42.2%). The percentage of illiterates were larger among female cases (85.8%) than male cases (39.4%). The percentage

of illiterates in control group were 31.7% and 52.1% in males and females respectively. The literate percentage in cases were 36.7% compared to 57.8% in controls. Some cases and controls were excluded from study due to unmatched age or sex (Table no-1) and Fig no.1 gives overall education status of the study.

Low income level is most common in cases (85.4%) compared to controls (73.8%). It was more in female cases (90.5%) when compared to male cases (80%). Middle and high-income level is seen more in controls group (16.2%) and (10.0%) compared to cases (9.2%). Income status and education status were strongest association with Oral cancer among demographic factors, even after adjusting for the effect of smoking, chewing and alcohol consumption.

There were 100 (55%) ever smokers among the cases and 59 (28.3%) ever smokers among the control group. About 80 (45%) and 121 (71.7%) in cases and controls respectively never smoked in their life time. Ever smokers showed 2.5-fold (95% CI 1.6342, 4.026) oral cancer risk without adjusting any other probable risk factors. After adjusting for chewing tobacco and alcohol, the risk increased to 3.4-fold (95% CI 1.371, 8.475). The analysis was not carried out for female group due to very less ever smokers in women. The ex-smokers who had given up the habits of smoking more than six months prior to the time of diagnosis had OR = 1.0 (95% CI, 0.399, 2.404).

Ever only beedi smokers were more common among male cases 30 (16%) against male control group 25 (13%). The risk in ever smokers after adjusting (chewing and alcohol), the OR was 3.1. (CI 95% 1.239, 7.970). The only beedi smokers in females were five numbers in cases and 3 numbers in control group, hence analysis was not performed. If we are not adjusting for cigarette smoking, chewing and alcohol, the risk of oral cancer in ever beedi smoker group was 2.2-fold (95% CI 1.399, 3.606). The detailed result is presented in table no. 3. Smoking only cigarette among cases 71 (39%) against controls groups 35 (19%), the risk in ever cigarette smokers in men

2.7 (95% CI, 1.6373,4.478) folds higher compare to never smokers. The OR 3.0 (CI95% CI 1.2945,8.789) fold more risk found in ever smoking men compared to never smoking men after adjusting with Beedi smoking, chewing and alcohol consumption, the result is found to be significant with 95% confidence level(Fig No.2).

Out of 180 persons, 55 (30.5%) ever beedi and cigarette smokers were in cases compared to 33 (18%) of control group. Ever smokers of both smoking 4.0-fold (95% CI 1.6271,10.2810) compared to never smokers of both habits. The risk is significantly higher in ever smoking of the above combination compared to never smokers, the adjusted OR and unadjusted OR is given in Table no.3.

The tobacco chewing habit was categorised into 1. Never chewer 2. Chewer 3. Gutka

4. Tobacco leaf 5. Tobacco stem (Kaddipudi) alone or with betel leaf or nut. In overall chewing habit, either any of the above combination was included. The reference value of all the Odds ratio in this study was risk among never chewer.

Out of 370 cases, 267 (72.1%) chewed the tobacco in one or other form compared to 128 (34.6%) in control groups. Ever chewing group showed 7.4 folds higher risk of Oral cancer compared to never chewer group (95% CI 4.8523, 11.3062) after adjusting with smoking and alcohol. In males, ever chewers showed 6.7 folds oral cancer risk after adjusting for smoking and alcohol. 111 (61.6%) male cases are chewing tobacco and 51 (28.3%) in control group are chewing tobacco. Compared to males, chewing habits seems to be more in females 156 (82%) and control group had 77 (40.5%) chewing habits, compared to never chewer 7.6 folds risk of oral cancer was observed (95% CI 4.5742,12.6661).

In males, 39 (21.6%) cases had gutka chewing habit against 14 (7.7%) in the control group, the OR was 3.3 (95% CI 1.656,6.797) compared to never gutka chewer. Among male ever gutka chewer, the OR was 6.3 (95%, CI 2.1246,11.6877) compared to never gutka chewer after adjusting with smoking and alcohol. Out of 370 cases

56(14%) were chewing only processed tobacco leaf, the OR was found to be 2.0 (95% CI 1.1499, 3.404). Among the males OR observed 2.9 (95 CI 1.2164, 7.2757) after adjusting with other type of chewing, smoking and alcohol consumption.

In females, the result was found to be statistically not significant with 95% confidence level. Women were more used to this habit compared to men. Among the women, ever chewing of the above habit were 87 (45.7%) and 11 (5.7%) in cases and controls respectively, the OR was found to be 4.3 (95% CI 7.599, 31.227) after adjusting with other type of chewing, smoking and alcohol consumption, the result found to be statistically significant with 95% confidence level. The analysis was performed with all combinations of chewing habits with and without adjusting with co-factors like smoking and alcohol. The OR for gutka with any other chewing habits in ever chewer was found to be 4.5 (95 CI 1.9457, 10.3704), tobacco leaf with any other chewing habits OR 4.8 (95% CI 2.8856,7.9482) in males.

Kaddipudi with other chewing habit, OR- 3.0 (95% CI 1.446, 6.2770). The detailed result gender wise is presented in the Table no.4. In all the above, single and combinations of the association is statistically significant with 95% confidence level.

Table no.5 gives ever alcohol drinkers 125 (33%) in cases and 73 (19%) in controls. The OR for ever drinker was 1.2 (95% CI, 0.994, 9.648) after adjusting with smoking and chewing, the OR was found to be not significant with 95% confidence level. There were only few cases of females who had the habit of drinking alcohol, hence analysis was not carried out for females. For males, alcoholic ever users, OR is 0.4 (95% CI, 0.104, 1.142). The OR was not found significant for wine and beer users. Ever hot drink users, OR (4.0) was found to be significant (95% CI 2.437, 6.44) with 95% confidence interval. There was no significant difference between current drinkers to ex-drinkers, the OR 0.9 (95% CI 0.438, 2.099).

Analysis was conducted to know the interaction effect between three habits of smoking, chewing

and alcohol consumption (Table no.6). The odds ratio was found to be significant between the cases and control with habit of smoking and chewing by adjusting alcohol, although risk was higher in cases (OR 3.8 95% CI 1.6438,8,9150). The interaction effect of smoking and alcohol consumption was statistically significant (OR 3.0

95% CI 1.2964,7.073). The tobacco chewing and alcohol was also found to be significant (OR 4.2 95% CI 1.823,9.902). In those who are having the habits of all the above, risk is higher (OR=6.1) and statistically significant (95% CI 2.7845, 13.1551).

Table no. 1: Number and Percentage distribution of Cases and Controls: Gender-wise

Sex	Cases		Controls	
	No	%	No	%
Males	180	48.6	180	48.6
Females	190	51.4	190	51.4
Total	370	100.0	370	100.0

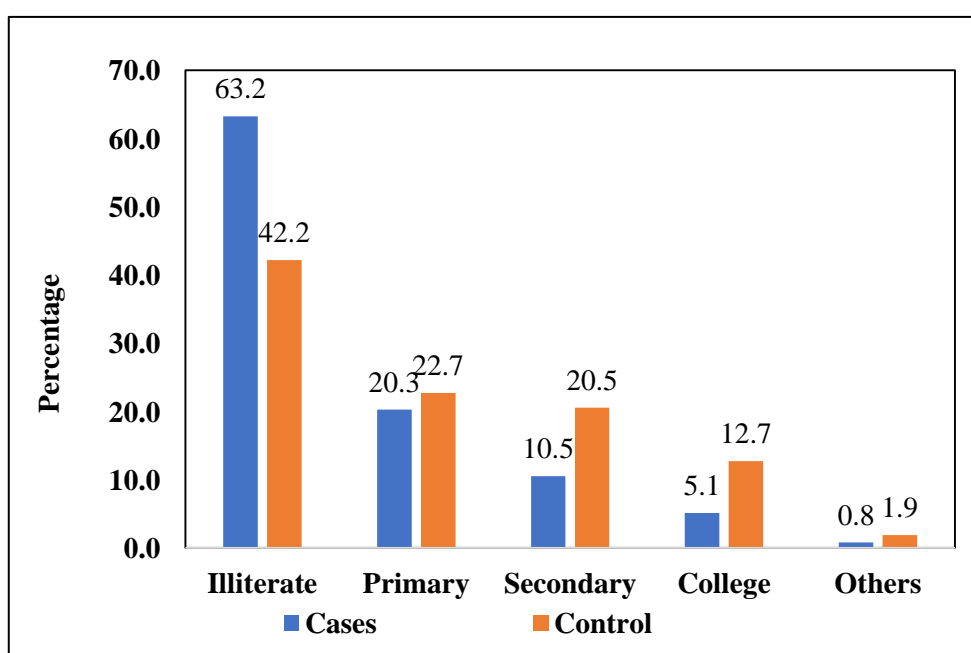


Fig. 1: Number and Percentage distribution of Cases and Control: Education Status



Fig. 2: A-Carcinoma Buccal Mucosa



Fig. 2: B-Carcinoma Tongue

Table no. 2: Number of Cases and Controls by demographic factors, Gender, Income, Education Status with Odds ratios (OR) of Oral Cancer

Demographic Factors	Cases	Controls	Odds Ratio	Adjusted Odds ratio
Age(Years)				
25-34	34	34	1 (0,0)	1 (0,0)
35-44	78	78	1.1 (0.68,1.685)	1.1 (0.636,1.774)
45-54	88	88	1.1 (0.676,1.737)	1.2 (0.718,2.108)
55-64	102	102	1.3 (0.686,2.483)	1.6 (0.765,3.461)
65+	68	68	1.2 (0.737,1.984)	1.2 (0.655,2.027)
Gender				
Males	180	180		1
Females	190	190	1.4 (1.015,1.98)	1.1 (0.69,1.627)
Income				
High	316	273	0 (0,0)	0 (0,0)
Middle	34	60	0.9 (0.411,1.789)	1 (0.449,2.408)
Low	20	37	1.6 (0.85,2.856)	2.3 (1.12,4.51)
Education Status				
College & above	27	19	1 (0,0)	1 (0,0)
Higher	65	78	1 (0.232,4.603)	1 (0.196,5.12)
Secondary	7	6	1.2 (0.289,5.351)	0.9 (0.189,4.597)
Primary	28	21	2.2 (0.525,9.368)	1.5 (0.32,7.396)
Illiterate	243	246	4 (0.957,17.059)	3 (0.618,14.201)

Table no.3: Number of Cases and Controls by Smoking status with Odds ratios (OR) of Oral Cancer and 95% confidence interval-Males

Tobacco Smoking	Cases (No)	Controls (No)	Odds Ratio	Adjusted Odds Ratio
Any Tobacco				
Never Smoker	80	121	1	1
Ever Smoker	100	59	2.5* (1.6342, 4.026)	3.4** (1.371, 8.475)
Only Beedi				
Never Smoker	103	135	1	1
Ever Smoker	77	45	2.2** (1.399,3.606)	3.1** (1.239,7.970)
Only Cigarette				
Never Smoker	109	145	1	1
Ever Smoker	71	35	2.7** (1.6373,4.478)	3.0* (1.2945,8.789)
Beedi and Cigarette Smoking				
Never Smoker	125	147	1	1
Ever Smoker	55	33	1.96* (1.1652,3.3199)	4.0** (1.6271,10.2810)

Table no.4: Number of Cases and Controls by Chewing status with Odds ratios (OR) of Oral Cancer and 95% confidence interval

Tobacco Chewing	Cases (No)	Controls (No)	Odds Ratio	Adjusted Odds Ratio
Any Tobacco Chewing				
Both Gender				
Never Chewer	103	242	1	1
Ever Chewer	267	128	4.9** (3.5436,6.7823)	7.4** (4.8523,11.3062)
Males				
Never Chewer	69	129	1	1
Ever Chewer	111	51	4.0** (2.5551,6.4910)	6.7** (3.0641,14.6551)
Females				
Never Chewer	34	113	1	1
Ever Chewer	156	77	6.7** (4.1063,11.1183)	7.6** (4.5742,12.6661)

Gutka				
Males				
Never Chewer	141	166	1	1
Ever Chewer	39	14	3.3** (1.656,6.797)	6.3** (2.1246,11.6877)
Tobacco Leaf				
Both Gender				
Never Chewer	314	349	1	1
Ever Chewer	56	29	2.1** (1.2777,3.4960)	2.0** (1.1499,3.404)
Males				
Never Chewer	149	167	1	1
Ever Chewer	31	13	2.6** (1.2976,5.7681)	2.9** (1.2164,7.2757)
Females				
Never Chewer	165	174	1	1
Ever Chewer	25	16	1.6 ^{ns} (0.8113,3.4250)	1.7 ^{ns} (0.8570,3.4007)
Raw Tobacco				
Females				
Never Chewer	103	179	1	1
Ever Chewer	87	11	4.1** (2.5107,6.9371)	4.3** (2.6064,7.0710)
Gutka with any Chewing				
Males				
Newer Chewer	114	156	1	1
Ever Chewer	66	24	3.7** (2.1664,6.6562)	4.5** (1.9457,10.3704)
Tobacco Leaf with any Chewing				
Both Gender				
Newer Chewer	248	334	1	1
Ever Chewer	122	36	4.6** (2.9972,7.0521)	4.8** (2.8856,7.9482)
Males				
Newer Chewer	149	167	1	1
Ever Chewer	31	13	2.7** (1.2976,5.768)	4.5** (1.9452,10.0736)
Females				
Newer Chewer	128	172	1	1
Ever Chewer	62	18	4.6** (2.5053,8.7025)	5.4** (2.7840,10.3366)
Tobacco Stem with any Chewing				
Females				
Newer Chewer	40	150	1	1
Ever Chewer	17	153	2.7** (1.4298,5.3141)	3.0** (1.446,6.2770)
Tobacco Stem with any Chewing				
Females				
Newer Chewer	110	80	1	1
Ever Chewer	72	118	2.2 ^{ns} (1.4637, 3.4718)	2.7** (1.7572, 4.2579)

Table no. 5: Number of Cases and Controls by Alcohol Consuming status with Odds ratios (OR) of Oral Cancer and 95% confidence interval-Males

Alcohol	Cases (No)	Controls (No)	Odds Ratio	Adjusted Odds Ratio
Never Drinker	245	297	1	1
Ever Drinker	125	73	2.9** (1.875,4.659)	1.2 (0.3868,3.9724)
Wine				
Never Drinker	5	365	1	1
Ever Drinker	125	357	0.4 (0.104,1.142)	-
Hot Drinks				
Males				
Never Drinker	86	141	1	1
Ever Drinker	94	39	4.0** (2.437,6.44)	1.9** (0.5704,6.1625)

Table no. 6: Number of Cases and Controls by Interaction between habitual status with Odds ratios (OR) of Oral Cancer and 95% confidence interval

Interaction Effects	Adjusted ODDS Ratio
Smoking * Chewing (Adjusted for Alcohol)	3.8** (1.6438,8,9150)
Smoking * Alcohol (Adjusted for Chewing)	3.0** (1.2964,7.073)
Chewing * Alcohol (Adjusted for Smoking)	4.2** (1.823,9.902)
Smoking * Chewing * Alcohol	6.1** (2.7845,13.1551)

Discussion

The present study indicates that exposure to smoking in any form, either by Cigarette or Beedi increases the chances of developing oral cancer. It is significantly associated with present smokers. In men, smokers developing Oral cancer is 2.5 folds higher before adjusting other risk factors like chewing and alcohol consumption. After adjusting, the risk increased to almost 3.4 folds. In female groups, the number of smokers were very less hence analysis was not carried out. This study consisting of a multicentric case control study was carried out at Bengaluru, Trivandrum and Chennai. Risk of getting oral cancer is almost 2 folds higher when compared to never smokers^[4]. In the present study association between Beedi smoking and oral cancer is found to be statistically significant after adjusting cigarette, chewing and alcohol. The analysis was not carried out for women due to small numbers of smokers.

The Beedi smoking exhibited higher risk of getting oral cancer compared to cigarette smoking, similar result was found in meta-analysis carried out by Mahabubar Rehaman et al. A total of 12 case-control studies was used for the meta-analysis, the author proved that an increased risk of oral cancer was found for bidi smokers compared to never smokers (OR 3.1, 95% confidence interval [CI] 2.0 –5.0)^[5], this result clearly indicate that bidi smokers are at increased risk of oral cancer. The present study revealed that a significant increased risk for smoking cigarette was seen in males compared with those who never smoked cigarette. The finding is consistent with most of the earlier studies, a study conducted by Balaram et al between 1996 and 1999, it was a

multicentric case-control study in 3 areas in Southern India. In the present study, the bidi with cigarette evolved as a high-risk (OR 4.0) factor compared to cigarette or beedi alone. This finding is consistent with results of earlier studies conducted by Nirmala C J et al, case control study which reveals that, Tobacco smoking with an odds ratio (OR) of 3.5 was significantly associated with the risk of oral cancer. The OR was 4.1 for combined bidi plus cigarette smokers and 3.7 for bidi smokers compared to non-smokers.

The present study revealed a significantly increased risk for tobacco chewing. In males and females, the odds ratio is almost 6.7 folds and 7.6 folds higher in males and females respectively, compared with those who never chewed after adjusting with smoking and alcohol consumption. This finding is consistent with the result of most of the earlier studies case-control design on data from a randomized control trial conducted between 1996 and 2004 in Trivandrum, India^[6].

The present study proved that gutka chewing among males had 6.3-fold higher risk of getting oral cancer compared to never gutka chewer. These products have been strongly implicated in the recent increase in the incidence of oral sub-mucous fibrosis, especially in the very young population, this precancerous lesion, which has a high rate of malignant transformation, is extremely debilitating and has no known cure^[7]. This study revealed a significant increased risk for tobacco chewing either processed leaf or stem in males and females, increasing risk of 2-3 folds for use of processed tobacco leaf and 2.7-4.3 folds higher among those who used tobacco stem.

The use of processed tobacco leaf (Khaini) was more common among men. The use of unprocessed tobacco, the cheapest form, varies in different parts of India. It is sold as bundles of long strands in Kerala or as leaf tobacco (Hogesoppu) in Karnataka. Kaddipudi is cheap 'powdered sticks' of raw tobacco stalks and petioles, used in Karnataka, usage of tobacco leaf and stem (Hogesoppu and Kaddipudi) is more common among women. The above findings are consistent with the results of earlier studies^[8].

Chewing tobacco is significantly and independently associated with an increased risk of squamous-cell carcinoma of the oral cavity (adjusted main-effect summary for case-control studies OR=7.46; 95% CI=5.86–9.50, P<0.001).

In the present study, effect of alcohol and Oral cavity cancers was observed in ever alcohol users (1.2 folds higher risk) after adjusting with smoking and chewing habits, the drinking of wine and beer risk is not associated because many of these groups are not regular drinkers, the consuming of hot drink increases the risk of oral cancer almost 4.0 folds. There is no statistical significance identified between cases and control with respect to age of alcohol consumption started and duration of alcohol use. This study results are consistent with most of the earlier studies. Andrade Jo study result reveals that an excessive alcohol consumption [OR = 3.25; 95%CI 1.03 - 10.22; p ≤ 0.044]. Rao D N also summarized that in those who had the alcohol habit, the relative risk was 1.42 and the dose-response relationship in terms of frequency and duration of the habit was also high^[9,10]. Present study identified synergistic risk (combined effect) of all the above products on Oral cancer using multiple logistic regression. The following results were obtained. Those who had habit of both smoking and chewing- risk of getting cancer is almost 3.8 fold higher and result is statistically significant with 95% confidence level. Combination of smoking and alcohol increases the risk almost 3.0 folds higher. The smoking, tobacco chewing and alcohol users group observed almost 4.2 folds

higher risk with all the three combinations. Risk estimated 6.1 folds higher in all the four combinations, which showed statistically significant result with 95% confidence limit. The above result is consistent with other studies. Wenjuine line et al. study provides evidence that Synergistic effect exists and ensured patients with all the above habits had an over 40-fold higher risk of developing Oral cavity cancer than in patients who abstained from all the habits^[11].

Conclusions

The present study indicates that exposure to smoking in any form, either by Cigarette or Beedi increases the chances of developing oral cancer. The association between Beedi smoking and oral cancer is found to be statistically significant after adjusting cigarette, chewing and alcohol. The Beedi smoking exhibited higher risk of getting oral cancer compared to cigarette smoking.

A significantly increased risk for Oral cancer was seen by chewing tobacco in males and females. Chewing tobacco is significantly and independently associated with an increased risk of squamous-cell carcinoma of the oral cavity. Synergistic risk (combined effect) of all the above products on Oral cancer was observed in this study.

The Oral Cancer risk with usage of tobacco products and smoking is well established. Awareness among general population must be carried out effectively for prevention of Oral Cavity Cancers and for better impact of Community Oncology Preventive Programs.

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