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Socio-Demographic Factors Related to Oral Cancer

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Abstract: Problem statement: The aim of this study was to identify factors related to cancer of oral cavity considering individual socio-demographic characteristics of a hospital based study in Pune. **Approach:** A case-control study was conducted. The cases were 350 with squamous-cell carcinoma of oral cavity diagnosed between 2005 and 2006 in Morbai, Narandia, Budharani Cancer Institute, Pune, India. Similar number of controls matched for age and sex selected from the background population. Cases and controls were interviewed for general characteristics; age, gender, education and possible socio-demographic factors. **Results:** Chi-square test in uni-variate analysis and estimate for risk showed that education, occupation and monthly household income were significantly different between cases and controls ($p<0.001$). Irrespective to gender, relative risk, here Odds Ratio (OR) of low level of education (OR = 5.3, CI 3.7-7.6), working in field as an agriculture (OR = 2.5, CI 1.7-3.7) and monthly household income less than 5000 Indian Rupees currency (OR = 1.7, CI 1.2-2.3) were significant risk factors for oral cancer. While, there was no significant relationship between religious and or marital status either in males or females. **Conclusion/Recommendations:** Socio-demographic factors such as education, occupation and income do play an important role in development oral cancer.

Key words: Education, income, occupation, oral cancer

INTRODUCTION

Cancers of the oral cavity includes cancers which occur in the tongue, floor of the mouth, Buccal mucosa, alveolus, retro molar trig one, gingival, hard palate and lips. It is one of the major worldwide public health problems (Franceschi *et al*., 2000) with the incidence and mortality rising in several regions of the world, including Europe, South Central Asia (particularly Taiwan) and Australia (Parkin *et al*., 2005). The prevalence of diagnosed oral cancer worldwide around 40% occur in India, Pakistan, Bangladesh and Sri Lanka (Ahluwalia, 2005). India has one of the highest rates in the world, accounting for one-third of the total cancers and unfortunately this form continues to rise (Pal and Mittal, 2004).

Tobacco and alcohol are established etiologic agents of these cancers, according to Castellsague *et al*. (2004) with attribute fractions of approximately 90%. Micronutrient deficiencies (Garrote *et al*., 2001; Sanchez *et al*., 2003) and poor oral hygiene (Talamini *et al*., 2000; Lissowska *et al*., 2003) has also been associated with increased risk. Oral cancer most commonly occurs in middle-aged and older individuals, although a disturbing number of these malignancies are also being documented in younger adults in recent years (Chen *et al*., 1990; Liewellyn *et al*., 2001; Schantz and Yu, 2002).

Many epidemiological studies conducted over the last three decades in America, Europe and Asia have provided strong evidence of an association between alcohol and tobacco use and an increased risk of oral and pharyngeal tumors (Madani *et al*., 2010; Blot *et al*.,

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1988; Franceschi *et al*., 1990; Zheng *et al*., 1990; 2004) but there was no report about the socio-demographic factors as independent risk for oral cancer in India. Hence, the aim of this study is to provide the socio-demographic factors of the oral cancer patients and compare it with age and gender matched healthy group as control. This will also help to find out whether the socio-demographic characteristics of the population play a role in the development of oral cancer.

MATERIALS AND METHODS

Setting of study: It was a hospital based case-control study, conducted at Morbai Naraindas Budharani Cancer Institute, Pune, India, during 2005-2006.

Study population: The subjects were selected using simple random sampling procedure. Cases were the new known patients of oral cancer aged above 18 years, diagnosed and confirmed by histopathological results and classified by the standard International Classification of Diseases (ICD-10) criterion. The controls were selected from the relatives, friends and neighborhoods of cases, who accompanied the patients referred to the hospital and cancer institute, who did not have cancer and thus apparently were healthy. The data related to demographic status and occupational was collected from both, cases as well as controls, after taking their written informed consent. The entire information was recorded through personal interview and semi-structured validated questionnaires.

A total of 700 subjects were taken for this study. Interviews were conducted in the local languages, including Hindi, Marathi and English with the help of a trained interpreter. Information related to education level was classified as illiterate, primary school (up to 5years education), middle school (6-8 years of education), secondary school (9-13. 12 years of education) and graduate (including both undergraduate and postgraduate).

Occupation was assessed according to respondents self reports and coded as follows; Agriculture, blue collar, white collar, self-employed, professional and unemployed. Income is categorized as less or more than 5000 Indian Rupees as monthly household income. Religion was in two categories, Hindu and others, while in terms of marital status it was 3 categories; married, unmarried and others. Tobacco use categorized as ever or never use of smoking and smokeless types. Alcohol and dietary habits also were assessed according to ever or never use of these factors.

Statistical methods: The data is presented as the numbers with percentage (prevalence) or mean with Standard Deviation (SD) as appropriate. The significance of difference between the proportions of qualitative characteristics is tested using Chi-square test of independence of attributes. The multivariate associations of risk factors with oral cancer were tested using multiple logistic regression analysis. All the associations were adjusted for potential confounders like age, gender; the use of tobacco and alcohol drinking. The entire data was analyzed using a Statistical Package for Social Sciences (SPSS) version 16.

RESULTS

The self-reported age in years at the time of data collection (interview) matched very well between cases and controls, ranging from 18-80 years with average age being 52 years ($p = 0.551$ by Students' test). The majority of subjects were above the age 40 years ($p = 0.780$). The gender distribution was also same in cases and controls with sex ratio being 2.5:1 and 2.6:1 respectively ($p = 0.800$ by Chi-Square test) (Table 1). Similarly, the place of residency was found to be same for the groups (cases and controls), 73% v/s 75% for urban and semi-urban and 27% v/s 25% for rural residence respectively.

In terms of education level (self-reported), illiterate number was higher for cases as compared to controls ($p<0.001$). The difference was more significant for higher level education, where in the percentage of high school and above education was more in controls compared to cases ($p<0.001$).

The employment data reveals that majority of the cases belonged to agriculture sector followed by blue collar; 25.4% v/s 12% and 23.4% v/s 18.0% as compared to controls ($p<0.001$ for all). The self employed and white collar numbers were higher for controls than cases while there was no difference in professional and unemployed percentages between the two groups. Monthly household income was significantly different between cases and controls. Majority of cases had lower household income <5000/- Rs ($p<0.001$).

In terms of religion, majority (~90%) of subjects (both cases and controls) belonged to Hindu Religion. While marital status has shown that the categories of married and others (widowed, divorced and separated) in both cases and controls was not significant different ($p = 0.198$ and $p = 0.430$ respectively). However, the difference was significant among cases and controls ($p<0.014$) for unmarried category.

Table 2 shows the crude odds ratio along with 95% confidence interval derived from the univariate analysis calibrated for socio-demographic characteristics such as education, occupation, income, religion and marital status in present and combination of main risk factors for oral cancer. The reference category for all demographical status was absence of the risk factors.

Table 1: Socio-demographic characteristics of subjects

Characteristics	Cases (350)	Controls (350)	p-value
Gender			
Male n = 505	251 (71.7)	254 (72.6)	0.800
Female n = 195	99 (28.3)	96 (27.4)	
Age (years)			
Mean (SD) [1]	52.4 (13.2)	51.8 (12.4)	0.551♣
Min-max	18.0-80.0	18.0-78.0	-
< 40 n = 153	78 (22.3)	75 (21.4)	0.780
41-50 n = 161	85 (24.3)	76 (21.7)	
51-60 n = 198	94 (26.9)	104 (29.7)	
61 + n = 188	93 (26.6)	95 (27.1)	
Location			
Rural n = 181	94 (26.9)	87 (24.9)	0.401
Urban and semi urban n = 519	256 (73.1)	263 (75.1)	
Education			
Literate n = 592	269 (76.9)	323 (92.3)	0.001
Illiterate n = 108	81 (23.1)	27 (7.7)	
Primary school n = 127	97 (27.7)	30 (8.6)	
Middle school n = 117	59 (16.9)	58 (16.6)	
High school n = 193	59 (16.9)	134 (38.3)	
Undergraduate n = 105	33 (9.4)	72 (20.6)	
Postgraduate n = 50	21 (6.0)	29 (8.3)	
Occupation			
Agriculture[2] n = 131	89 (25.4)	42 (12.0)	0.001
Blue collar[3] n = 145	82 (23.4)	63 (18.0)	
White collar[4] n = 86	32 (9.1)	54 (15.4)	
Self-employed[5] n = 123	49 (14.0)	74 (21.1)	
Professional n = 50	21 (6.0)	29 (8.3)	
Unemployed n = 165	77 (22.0)	88 (25.1)	
Monthly Income[6] Rs			
<5000 n = 319	183 (75.6)	136 (51.7)	0.001
≥5000 n = 186	59 (24.4)	127 (48.3)	
Religion			
Hindu n = 610	310 (50.8)	300 (49.2)	0.001
Others[7] n = 90	40 (44.4)	50 (55.6)	
Marital status			
Married n = 624	316 (90.3)	308 (88.0)	0.198
Unmarried n = 38	12 (3.5)	26 (8.0)	0.014
Others[8] n = 38	22 (6.7)	16 (4.9)	0.430

Values are n (%), p-by Chi-square test, ♣ p-by t-test, p>0.05 = Not significant; ([1]) standard deviation; ([2]) farm's worker; ([3]) manual/industrial laborers; skilled/unskilled, building/construction and mechanical worker; ([4]) non-manual labor working in office; ([5]) businesspersons/contractors, property owners; ([6]) monthly income (Indian rupees); ([7]) Muslim, Christian, Buddhist and Sikh; ([8]) widowed, divorced or separated

The commonest independent risk regarding these factors was education, low level education (primary school), with the gender specific odds ratio of 3.3; 3.6-11.1, in males and 4.6; 2.1-10.3, in females. The next common risk was the income, less than 5000 monthly household income, with OR = 2.4; 1.6-3.7, in males and OR = 6.4; 1.5-17.2, in females, followed by the occupation type, working in field, with the sex specific odds ratio being 2.1; 1.4-3.2, in males and 4.7; 1.6-14.0, in female. However, among males blue collar job also was a significant factor (OR = 1.5; 1.0-2.2).

Table 2: Risk of oral cancer by selected socio-demographic characteristics in male and female (unadjusted risk)

	OR* (95% CI)		
Characteristics	Overall	Males	Females
Education			
Illiterate	3.6 (2.2-5.7)	2.3 (1.2-4.5)	5.3 (2.6-10.8)
Primary school	5.5 (3.5-8.6)	3.3 (3.6-11.1)	4.6 (2.1-10.3)
Middle school	1.3 (0.8-1.9)	1.5 (0.9-2.5)	0.1 (0.0-0.6)
Secondary school	0.4 (0.2-0.5)	0.3 (0.2-0.5)	0.5 (0.2-1.1)
Graduated[1]	1.0	1.0	1.0
Occupation			
Un-employed[2]	0.8 (0.6-1.2)	0.1 (0.0-0.5)	1.1 (0.7-1.6)
Agriculture[3]	2.5 (1.7-3.7)	2.1 (1.4-3.2)	4.7 (1.6-14.0)
Blue collar[4]	1.4 (0.9-2.0)	1.5 (1.0-2.2)	0.5 (0.1-1.2)
White collar[5]	0.5 (0.3-0.9)	0.6 (0.4-0.9)	0.4 (0.1-2.0)
Self-employed[6]	0.6 (0.4-0.9)	0.6 (0.4-0.9)	0.3 (0.1-1.6)
Professional[+]	1.0	1.0	1.0
Income Indian rupees			
Less than 5000	2.9 (1.9-4.2)	2.4 (1.6-3.7)	6.4 (1.5-17.2)
More than 5000[+]	1.0	1.0	1.0
Religion			
Hindu	1.3 (0.8-2.0)	0.9 (0.7-1.3)	1.2 (0.9-1.7)
Others[+ 7]	1.0	1.0	1.0
Marital status			
Married	1.3 (0.7-2.0)	1.1 (0.8-1.5)	1.0 (0.7-1.4)
Others[8]	1.4 (0.4-2.7)	0.5 (0.1-1.6)	1.3 (0.9-5.4)
Un-married[+]	1.0	1.0	1.0

*: Unadjusted odds ratio; +: Reference group; (1) under and post graduate level; (2) included students and housewives; (3) farm's worker; (4) manual/industrial laborers, skilled/unskilled factory worker, building/construction worker and mechanical worker; (5) non-manual labor working in office; (6) business person, contractors and property owners; (7) Muslim, Christian, Buddhism and Sikh; (8) widowed, divorced and separated

Religion and marital status did not show any association with the development of oral cancer independently. Neither of them appeared to increase the risk, either in males or in females (OR was less than 1 in types of religion and marital status among both males and females).

DISCUSSION

Oral cancer has been found to be more prevalent among men compared to women; the associated sex ratio was 2.5:1. This ratio seems to be vary from one study to the other in India for example, Sankaranarayanan *et al*. (1990) has reported almost the same ratio (2:1) and Mehrotra *et al*. (2003) has shown higher ratio (3.27); while lower ratios have been reported by Chattopadhyay (1989) (1.76:1). It may be due to the more exposure to risk factors such as tobacco and alcohol by men compare to women. According to Subramanian *et al*. (2004), in India men are considerably more likely to smoke as well as chew tobacco than women, OR = 19.69 and 3.27 respectively.

Oral cancer is well known to occur in the age group 40 and above. Surprisingly in our study a large percentage (23%) of cases were found to be below the age of 40 years. Similar finding has been reported from Pakistan by Bhurgri (2005). While only 4-6% of oral cancer subjects below the age 40 years have been reported by Liewellyn *et al*. (2001), who critically examined 46 publications devoted to oral cancer in the young adults. This high percentage of young adults affected by oral cancer in present study may be due to increasing trend of consumption of smokeless tobacco types, in particular gutkha by this age group. Areca nut is also a most commonly used ingredient, directly or in betel quid. According to Shah *et al*. (2002), 74% of children of primary school in Karachi, Pakistan, use areca nut and 35% chew betel quid (pan). Similar study in school children from Chennai, India (Kumar *et al*., 2006) has reported around 41.1% of the students to be the current users of tobacco (any products). The early age development of oral cancer is a matter of great concern in this study.

In this study, the low degree of educational status was widespread among cases compared to the controls. The majority of cases was the rural residents and had agriculture as a source of occupation. This has resulted in their monthly income level; the cases had relatively lesser income compared to the controls. The study thus, suggests that the risk of oral cancer is inversely proportional to increasing level of education and economical status. It is further confirmed by multivariate analysis, which shows that education, particularly low education, occupation, agriculture and blue collar and low monthly household income were the significant independent risk factors. These findings are consistent with the similar studies done in the other parts of India by Chattopadhyay (1989); Sankaranarayanan *et al*. (1989) and Rao *et al*. (1994) reported earlier.

The odds ratio derived by univariate analyses suggest that all socio-demographic factors except religion and marital status to be significant risk in this study. Women with oral cancer were more affected by socio-demographic factors, particularly, education, occupation and income. Our findings are supported by Sorensen *et al*. (2005), which believes that social and demographic characteristics are in relation to oral cancer. It may be due to effect of socio-demographic characteristics, in particular, education and occupation on tobacco use among men; therefore, it can effect on development of oral cancer.

Cancer in general is multi-factorial in origin and several environmental interactions are possible. Age, gender, illiteracy or low education level, occupation; working in agriculture sector, income; low monthly household income, marital status and married people resulting in smoking, chewing, drinking and dietary habits can be considered as significant contributing factors modifying the multistage process of carcinogenesis.

CONCLUSION

Results of the present study revealed the differences in the habits according to verities in socio-demographic characteristics between cancer patients and controls which suggest that socio-demographic factors do play an important role. The social awareness through the education programs about the risk of oral cancer in India is highly warranted. We recommend that, these programs need to be implemented on urgent basis at the school level particularly in rural areas. Adding some information (chapters in science text books) about the consequences of tobacco use in the syllabi of the curriculum will definitely serve some purpose of prevention to a considerable extent.

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