

Effect of dietary habits in combination with alcohol and tobacco on oral cancer: A case-control study

Asghar Razmara¹, Abdoul Hossain Madani^{1*} and Farideh Daneshnia²

¹ Department of Public Health, Research Center for Social Determinants in Health Promotion, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

² Hormozgan University of Medical Sciences, University of Applied Science and Technology, Bandar Abbas, Iran
amadani@hums.ac.ir

Abstract: One of the problems that considered as risk factors for oral cancer is use of alcohol and tobacco. Present study explores effects of dietary habits in combination with alcohol and tobacco on oral cancer. For this, a case-control study was conducted at Pune, Morbai Naraindas Budhrani Cancer Institute within 19 months from February, 2005 to September, 2006. Study sample were 700 age-gender grouping matched subjects including 350 cases and 350 controls were selected using simple random sampling. The significance of difference between the proportions of qualitative characteristics is tested using Chi-square test of independence of attributes. The quantitative risk assessment was done by calculating the odds ratios (OR) with 95% confidence intervals. Results indicated that smoking, drinking and non-vegetarian intakes appear to have interaction effects on developing oral cancer.

[Razmara A, Madani AH and Daneshnia F. **Effect of dietary habits in combination with alcohol and tobacco on oral cancer: A case-control study.** *Life Sci J* 2013;10(2s):160-163] (ISSN: 1097-8135).
<http://www.lifesciencesite.com>.27

Key words: Alcohol; Tobacco; Oral Cancer; Dietary Habits

1. Introduction

Alcohol and Tobacco are regarded as the major risk factors for oral cancer (Shah et al., 2003). Large scale epidemiological investigations have documented a synergistic effect of tobacco and excessive use of alcohol on the occurrence of oral cancer. Tobacco use a major public health problem causes considerable morbidity and mortality worldwide. Evidently, smoking cause's more than 5 million deaths per year and by the year 2020 will exceed 10 million a year (M.AI-Bedah et al., 2012; Rahim et al., 2012; Morad-beigi et al., 2012).

One estimate suggests that three-quarters of all these cancers are attributable to these two factors (Blot et al., 1998). Nevertheless, nutrition probably accounts for some of the nest and also may influence the affects of tobacco and alcohol. By one estimate nutritional factors account for 35% of all cancers (Doll and Peto, 1981). Dietary factors have been thought to account for about 30% of cancer in western countries (Key et al., 2004). The contribution of diet to cancer risk in developing countries has been considered to be lower, perhaps around 20%.

Pervious researches confirmed the relationships between healthy status and behaviors such as physical activity and nutritional behavior (Sajjadi et al., 2011). A high intake of fruits and vegetables probably reduces the risk of oral cancer, and consumption of very hot drinks and foods typically consumed in some cultures probably increases the risk of cancers of the oral cavity and pharynx.

Indian population is characterized by a heavy consumption of vegetable, whereas non-vegetarian is a rather uncommon diet item. As India is fast moving towards industrialization and westernization, with the advent of western life style Indian population are moving towards a diet rich in animal proteins. This coupled with other habits like tobacco use (chewing as well as smoking) and alcohol is likely to increase the disease burden especially cancer and cardiovascular diseases.

This study investigate effect of dietary habits in combination with alcohol and tobacco on oral cancer in India.

2. Material and methods

A case-control study was conducted at Pune, Morbai Naraindas Budhrani Cancer Institute within 19 months from February, 2005 to September, 2006. A total of 700 age-gender grouping matched subjects including 350 cases and 350 controls were selected using simple random sampling. Cases were the newly diagnosed patients of oral cancer aged above 18 years; The controls were selected from the relatives, friends and caretakers of cases, who were accompanied the patients at the hospital and were healthy and did not reportedly have cancer. At the well-situated a trained interviewer interviewed the case and control participants.

We used structured questionnaire to obtain complete information on demographical characteristics such as age, gender, education, income, place of residency, occupational history, religion, marital status, tobacco-related behavior, smokeless

tobacco, alcohol consumption and dietary habits. The significance of difference between the proportions of qualitative characteristics is tested using Chi-square test of independence of attributes. The quantitative risk assessment was done by calculating the odds ratios (OR) with 95% confidence intervals. The entire data was analyzed using a statistical package for social sciences (SPSS) version 13.

3. Results

Table 1 shows the odds ratio of oral cancer among the different dietary habits. In general, non-

vegetarians had the significant increased risk of oral cancer compared to vegetarians (1.8 v/s 0.4, $p < 0.001$). Of the non-vegetarians, the Red meat was the highest risk of oral cancer compared to those who did not eat Red meat regularly 2.8 (1.5-2.9). Further the regular white meat eaters also had significantly increased risk of oral cancer 2.1 (2.0-3.8). The regular root vegetable and fruit eating habit were significantly associated with probably protective effect on oral cancer.

Table 1. Risk of oral cancer according to dietary habits

Factors	Cases	Controls	Odds Ratio (OR)	95% CI of OR	P-value
Vegetarian diet	52	145	0.2	0.3-0.6	0.001
Non-Vegetarian diet	298	205	4.0	2.8-5.8	0.001
Red meat	252	191	2.8	1.5-2.9	0.001
White meat	258	174	2.1	2.0-3.8	0.001
Green vegetable	301	308	0.8	0.5-1.3	0.431
Root vegetable	246	279	0.6	0.4-0.8	0.004
Fruits	271	304	0.5	0.3-0.7	0.001

P-value by Chi-square test

Table 2. Risk of oral cancer according to combined effects of active smoking and non-vegetarian

Factors	Cases	Controls	Odds Ratio (OR)	95% CI of OR	P-value
Filtered cigarette + Non-vege	41	20	5.5	3.0-10.3	0.001
Non-filtered cigarette + Non-vege	13	5	7.4	2.5-22.0	0.001
Bidi + Non-vegetarian diet	62	12	16.0	8-32.5	0.001

P-value by Chi-square test

Table 3. Role of diet on oral cancer in combined use of alcohol & active smoking

Combination	Cases	Controls	Odds Ratio (OR)*
NV(+), AS(+), A(+)	48	15	4.8 (0.7-31.5)
V(+), AS(+), A(+)	2	3	1.0
NV(+), AS(+), A(-)	64	23	5.1 (2.1-12.2)
V(+), AS(+), A(-)	11	20	1.0
NV(+), AS(-), A(+)	53	20	8.8 (2.2-35.4)
V(+), AS(-), A(+)	3	10	1.0
NV(+), AS(-), A(-)	133	147	2.8 (1.8-4.4)
V(+), AS(-), A(-)	36	112	1.0

NV: Non-Vegetarian, V: Vegetarian, A: Alcohol drinkers, AS : Active smokers; + : Present, - : Absent * Un-adjusted OR

Table 2 shows the risk of oral cancer among the non-vegetarians who were active smokers. The highest risk of oral cancer was seen in the condition of combined bidi smokers and non-vegetarians and the risk was 16.0 (8.0-32.5). The combination of non-filtered smoking and non-vegetarian habit had significantly increased risk (but lower than bidi smoking and non-vegetarianisms) of 7.4 (2.5-22.0) compared to those who did not have this combined habit. The combination of filtered cigarette and non-vegetarians had the least but significant risk of oral cancer 5.5 (3.0-10.3) compared to those who did not

have this combined habit. A remarkable finding is that combination of bidi smoking with non-vegetarian diet increases the risk of oral cancer approximately by 4 times compared to the bidi smoking alone (16.0 v/s 4.1).

Odds ratio for oral cancer was significant amongst subjects who were non-vegetarian and consumed alcohol regularly but did not smoke tobacco, OR=8.8 (2.2-35.4) compared to whom with no smoking but with drinking habit (Table 3).

Non-vegetarian subjects who had active smoking habit but did not drink alcohol regularly were

in risk of 5.1 (2.1-12.2) they were compared with vegetarian subjects in same habits. Non-vegetarian without having habit of active smoking and drinking compare to vegetarian in same habit were in risk of 2.8 (1.8-4.4). That means, that maybe non-vegetarian habit is independent risk factor for oral cancer, however, in unadjusted odds ratio it is not easy to reduce the effect of possible confounders so in multivariate analyses the role of diet will be clearer.

4. Discussion

In this study, the cases were predominantly non-vegetarians compared to the controls. Of these non-vegetarians majority of them were the red meat consumers on regular basis. The intake of non-vegetarian was positively related with oral cancer. Subjects who ate red meat at least once a week had nearly threefold higher risk of oral cancer compared with subjects who did not consumed red meat. While, white meat had shown two fold risk on subjects who consumed at least once a week. Red meat may contain large quantities of polycyclic aromatic hydrocarbons (PAHS) and hetrocyclic amines (HCAs) which are carcinogens formed in or on the surface of well-done meat, cooked at high temperature. Though recently a few studies have reported about a safer role of white meat (poultry and fish) in the development of oral cancer.

Further, the increased frequency of fruits and vegetable consumption was a protective factor for oral cancer in this study. Our findings are consistent with the Liewellyn et al. wherein, reported the long term consumption of fresh fruits and vegetables in the diet to be protective for both males and females, in the systematic case-control study done in South east of England, who have particularly investigated the role of duration of fruits intake in oral cancer systematically in their (Liewellyn et al., 2003).

Antioxidants rich food such as green leafy vegetables and fruits that may help reduce the oxidative stress caused by tobacco are usually lacking in the diet of poor. This makes them more vulnerable to induced oxidative stress with more damaging effects than in a well-nourished population.

Risk of oral cancer increased significantly when non-vegetarian diet is combined with the smoking as well as smokeless form of tobacco. We cannot say that the non-vegetarian diet may be a risk factor for oral cancer, as our study is a cross sectional study and suffers a drawback of defining the causality. More involved studies are required to comment about the role of non-vegetarian diet in oral cancer. However, a possible explanation for this association could be the tobacco specific nitrosamine, which is one of the most important etiologic factors for oral cancer and polycyclic aromatic hydrocarbons undergo

specific activation and toxification process, and may be important carcinogens. Their reactions are controlled by antioxidants such as quercetin in vegetables.

However, Umesh et al. (2004) have reported that the approximately 15% of oral and oropharyngeal cancers can be attributable to dietary deficiencies or imbalances. Increase in risk has been reported to derive from high intake of foods that represent important sources of calories, such as starchy foods, pulses, certain meats especially preceede meat, charcoal grilled meat, pork and eggs (Franceschi et al., 1991; Chopra et al., 1996). They further reported that the high meat intake accounted for 49% of the population attributable risk (PAR) while low vegetable intake accounted for 65% of the PAR. Suggesting that the vegetarian diet may be a protective factor against the oral cancer. Thus, our findings are consistent with the Umesh et al. (2004). The specific mechanism of how fruits and vegetables prevent carcinogenesis is unclear, but fruits and vegetables contain Vitamin C, B (Beta-Caroten and other carotenoids, which are efficient antioxidants and can prevent damage to chromosomes. Chopra et al. (1996) reported that, However, antioxidant-rich foods such as green leafy vegetables and fruits that may help reduce the oxidative stress caused by tobacco.

5. Conclusion

Our results support the statements that smoking, drinking and non-vegetarian intakes appear to have interaction effects on developing oral cancer. In this study we report that the vegetarian diet is a protective dietary habit for oral cancer. Hence, promoting vegetarianism in India may serve the purpose of prevention of oral cancer to some extent. However, there is a possibility of lack of proper nutrition in vegetarian diet, this aspect need to be considered while framing policies related to the diet.

Corresponding Author:

Abdoul Hossain Madani
Department of Public Health, Research Center for Social Determinants in Health Promotion,
Hormozgan University of Medical Sciences,
Bandar Abbas, Iran
E-mail: amadani@hums.ac.ir

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2/2/2013