Risk Factors of Oral Cancer : An Overview

Abstract Oral cancer (OC) is an epithelial neoplasia generally beginning as a focal clonal overgrowth of altered stem cells near the basement membrane, expanding upward and laterally, replacing the normal epithelium. This is an overview on cultural, dietary, gender related hormonal factors and dental factors in relation to oral precancer and cancer.

Keywords Oral Cancer, Risk Factors, Dietary factors, Gender related hormonal factors, Dental factors.

Dr. Medha Deora
Senior Lecturer
Dept. of Oral Pathology & Microbiology
Desh Bhagat Dental College, Muktsar, Punjab

Introduction

Oral squamous cell carcinoma (OSCC) is the sixth most common malignancy and is a major cause of cancer morbidity and mortality worldwide. Globally about 500,000 new oral and pharyngeal cancers are diagnosed annually, and three quarters of these are from the developing world.

Oral cancer is an epithelial neoplasia generally beginning as a focal clonal overgrowth of altered stem cells near the basement membrane, expanding upward and laterally, replacing the normal epithelium. The neoplastic process is a beginning with normal epithelium progressing through hyperplasia to dysplasia to carcinoma in situ and invasive carcinoma.[1]

The concept of a two-step process of cancer development in the oral mucosa, i.e., the initial presence of a precursor subsequently developing into cancer, is well-established. Oral leukoplakia is the best-known precursor lesion.[2]

Oral cancer arises from keratinocyte mutations

The cell of origin of OSCC is the oral keratinocyte. OSCC, as any cancer, is caused by DNA mutation, often spontaneous but increased by exposure to any of a range of mutagens – chemical, physical or microbial. The various changes in the DNA can progress from a normal keratinocyte to a pre-malignant or a potentially malignant keratinocyte that is characterised by an ability to proliferate in a less-controlled fashion than normal. The cells become autonomous and a true cancer results, characterised by invasion across the epithelial basement membrane and, ultimately, metastasis to lymph nodes, bone, brain, liver and other sites.[3]

DNA Mutations Have More Than One Cause: Risk factors

1 Cultural and Dietary risk factors
2 Gender related hormonal risk factors
3 Dental factors
4 Other factors

Cultural and Dietary risk factors

Tobacco habits are practiced worldwide in many forms. In developing countries, the habit of quid chewing is widespread especially among the older generation.

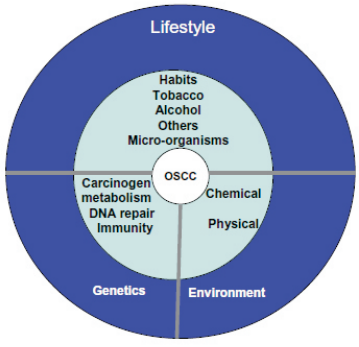

Figure 1 Diagrammatic summary of main OSCC risk factors.

Tobacco smoking / quid chewing can cause oxidative stress. Oxidative stress refers to sustained presence of reactive oxygen specially (ROS) in tissues. ROS has been implicated in the initiation of cellular free radicals. Thus, ROS can cause damage to proteins, lipids, carbohydrates and DNA.

The role of dietary factors on the incidence of all epithelial cancers has been the focus of many current studies. Finding from a combination of these studies led to an accumulation of evidence suggesting that some micronutrients such as Vitamin A, C and E and carotenoids such as beta- carotene and selenium may decrease the incidence of epithelial cancer.

The protective effect of some of these micro nutrients has been attributed to their anti-oxidant activities. Anti- oxidants act by reducing the free radicals reactions that can cause DNA mutations and changes in lipid peroxidation of cellular membranes and changes in enzymic activities. Other protective roles of micronutrients are modulation of carcinogen metabolism, affects cell transformation and differentiation. Inhibition of cell proliferation and oncogene expression, immune function and inhibition of endogenous formation of carcinogen.[4]

Gender related hormonal risk factors

Oral cancer (OC) is a neoplasm with fairly high male to female ratio in most populations. The conspicuously lower incidence of this tumor among women than man is suggestive of certain endocrine involvement in its development.

a. **Controversial associations between female sexual steroids and cancer**
Nowadays, a prevailing concept is the positive correlation between female sexual steroid hormones and risk for ovarian, breast and endometrial cancers. Hormone replacement therapy (HRT) in postmenopausal women is fairly widespread in the Western countries, and it is regarded as a causal factor of increased prevalence of cancers. A protective role of HRT against smoking-associated cancers, such as OC, was justified among smoker postmenopausal women.

b. **Correlations of estrogen deficiency and cancer risk**
An abrupt decrease of estrogen hormone levels either after a natural or an artificial menopause may cause gene regulation disturbances. As cancer initiation requires many years, the longer the postmenopausal estrogen deficiency period the higher the possibility of cancer development.

c. **Alcohol-derived metabolic and hormonal changes and oral cancer**
Alcohol consumption is a well-known, strong risk factor for OC. However, alcohol consumption is associated with contradictory metabolic effects. Mild to moderate alcohol intake is associated with improved insulin sensitivity, while the two extremes; complete abstinence and excessive drinking impose risk for insulin resistance in both genders. In women who regularly consume alcoholic beverages, especially in postmenopausal cases, estrogen levels are elevated as alcohol mediates an increase of estrogen synthesis in the adipose tissue. This novel hypothesis of estrogen deficiency and elevated fasting glucose as risk factors for OC may provide new insights into etiology of oral malignancies.[5]

Dental factors in genesis of Oral Cancer

Long standing irritation from chronic periodontal disease, poor oral hygiene, ill fitting dentures, sharp teeth, mouthwashes, electrogalvanism and edentulism have all been implicated as cofactors in genesis of oral cancer[6].

Other multiple risk factors

Occupational factors due to actinic raditions is one of the factors for Oral Cancer. Socioeconomic status is widely held to be inversely related to the incidence of oral cancer.

A viral eitology has been proposed in form of human herpes and human papilloma virus. Malnutrition, dietary deficiency of Iron and vitamins A and C as well as occupational exposure to nickel, textiles and wood dust have also been implicated.

Some authors believe that some variants of Lichen Planus and Candidiasis have the propensity to be premalignant[6].

Conclusion

Prevention is a critical issue, giving the disappointing progress over the past years. With improved nutrition and a reduction in the use of tobacco products, the incidence and survival figures for OC are largely preventable.

References

1. Nagpal JK, Das BR. Oral cancer: reviewing the present understanding of its molecular mechanism and exploring the future directions for its effective management. Oral Oncology 2003;39: 213-21
2. Reibel J. Prognosis of oral pre-malignant lesions: Significance of clinical, histopathological and molecular biological characteristics. Crit Rev Oral Biol Med 2003;14(1) :47-62
3. Scully C, Began J. Oral squamous cell carcinoma overview. Oral Oncology 2009;45:301-8
4. Zain R B. Cultural and dietary risk factors of oral cancer and precancer- a brief overview. Oral Oncology 2001; 37: 205-10
5. Suba Z. Gender related hormonal risk factors for oral cancer. Pathology oncology research 2007;13(3):195-202
6. Lockhart P B, Norris C M, Pulliam C. Dental factors in the genesis of squamous cell carcinoma of the oral cavity. Oral Oncology 1998; 34: 133-9