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Estimation of Lipid Peroxidase & Micronucleus Status in Oral Cancer

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Abstract: ***Introduction: Oral cancer is caused by the consumption of tobacco, cigarettes, but even those who do not consume it are likely to have cancer (Only my health Editorial team, 2011). It is one of the most common types of cancer worldwide and in India it is the second most common cancer after lung. In Madhya Pradesh, it is the most common type of cancer. This highest incidence of mouth cancer in central region in India can be attributed to tobacco use in Central India. There is an alarming need to look for diagnostic measures for its early and effective treatment. Biochemical analysis of oral cancer patients by estimating lipid peroxidase and genetic damage by micronucleus assay can be good predictor of cancer and can be used for diagnosis as well as prognosis. The present review work explores the various studies done on the utility of biochemical and genetic analysis in oral cancer patients with regard to lipid peroxidase level to check for oxidation stress that can lead to cancer and micronucleus assay to look for genetic damage in cancer. Method: PubMed, Cochrane data were explored for relevant studies by through electric search and the selected studies were analyzed and summarized for clarification and providing more insight into the subject. Results: A number of studies have been done in the above-mentioned topic and have supported the role of these biochemical and genetic assays in determining cancer risk.***

Keywords: Biochemical analysis, lipid peroxidase, micronucleus, oral cancer.

1. Introduction

When the cell of any part of the body becomes uncontrollably larger than ordinary cells, it becomes cancerous due to which the body stops functioning normally. In most people, cancer is treated very well and they live a full life after treatment. Cancer is not one type of disease, but a group of diseases and it can be of many types that can start anywhere in the body, such as in the Mouth, Lungs, Chest, Breast, Ovary, Cervix, Rectum, Blood, Skin, Bone, Brain etc (**Byers *et. al.*, 2002**). In India, oral cancer is one of the most common malevolence and it is the major form of the cancer worldwide. Hence, its early detection is of utmost importance. It contributes to about **30-40%** of all cancers. In India, tobacco chewing with betel quid or tobacco smoking and alcohol consumptions is the most important etiologic agents of oral cancers. Oral cancer is cancer that develops in the tissues of the mouth or throat (**Ganesan and Kumar, 2014**). There are many types of oral cancer, which include cancers of the lips, tongue, inner lining of the cheek, gums, hard and soft palate, floor of the mouth etc. Cancer is a major group of diseases and has many causes. According to World Health Organization (**WHO**), the most common risk factors for cancer are genetic factors, environmental factors, dietary factors and cancer caused by infection, drug and medical treatment etc. (**R Doll, R Peto, 1981**).

Lipid peroxidation and micronucleus are indicators of cellular and genomic damage that can increase the risk of oral cancer. During lipid peroxidation, free radicals attract the hydrogen atom from the polyunsaturated fatty acid (**PUFA**) of the plasma membrane and produces peroxide, which are themselves unsettled and more reactive thereby resulting in loss of membrane functions (**Mahadevan and Velavan *et.al.*, 2012**). Micronuclei are one biomarker that defines chromosomal aberrations in exfoliated buccal mucosal cells by taking up the stain. Micronuclei (**MN**) are a small extra nucleus separated from the main one generated during cell division (**Das PK *et. al.*, 1992**).

Oxidative stress has been known to play a huge role in the carcinogenesis process; therefore, level of lipid peroxidation can be a good indicator of determining this stress and hence risk of cancer development eventually. In this regard, several studies have been done. To cite one such study, **Rasool *et.al.*, 2014** estimated lipid peroxidation and antioxidant status in oral squamous cell carcinoma (**OSCC**) patients and compared the sensitivity and specificity of circulating biomarkers with **Beta-2MG** at different thresholds in blood and saliva using receiver operating characteristics curve design. The status of salivary lipid peroxidation in oral cancer and in pre-cancer was given by **Shishir Ram Shetty, *et.al.*, (2014)**. Malondialdehyde (**MDA**) is widely used product of polyunsaturated fatty acid peroxidation. The highly toxic molecule aldehyde considered as marker of lipid peroxidation in oral carcinogenesis.

Ramadan *et.al.*, 2017, studied the role of oxidative stress in epithelial ovarian cancer in Egyptian patients and found out that patients with epithelial ovarian cancer has decreased preoperative serum level of SOD and GPX antioxidants and increased level of MDA. These findings were associated with advanced tumor stage. The study confirmed the role of oxidative stress in development of epithelial ovarian cancer.

Micronucleus is characteristically seen in exfoliated epithelial cells like buccal mucosa and urinary bladder wall during cancerous and precancerous condition in less and large magnitude step by step. It is used as a biomarker to assess the stage severity of neoplasm. In a study done by **K. Sathynarayana Reddy *et al.*, (2008),** oral carcinoma patients in various stages as well as patients with pre-malignant lesions were tested for micronucleus (MN) and the data showed that most of the patients were tobacco users

and chronic tobacco use has caused more number of MN in them thus indicating its use a biomarker and screening test.

Another study was done by **Akanksha Gupta *et. al*., 2016** who explored the micronuclei frequency in oral cancer and found that micronuclei frequency was higher in malignant disorder group as compared to control.

Cancer is also known to be caused by increased production of reactive oxygen species by various physiological reactions. Lipid per-oxidation is one such mechanism. Carcinogen like polycyclic aromatic hydrocarbons (**PAH**) is present in tobacco that increases the risk of squamous cell carcinoma of oral cavity. The genotoxicity of alcohol, tobacco and betel nut chewers can also be indicated by the increase of micronuclei. It means that increased use of these leads to DNA damage indicated by micronuclei (**Pratheepa Sivasankari *et.al*., 2015**).

Lipid peroxidase analysis is generally done by standard protocol of malondialdehyde (**MDA**) and thiobarbituric thricholoroacetric-acid (**TBA-TCA**) assay method **(Denise Grotto *et al*., 2009)**. Lipid peroxidation has been studied broadly in relation to cancer, modulation by antioxidant and their contacts. Large numbers of byproducts are formed during this process. These can be measured by different base. The most common method used in the evaluation of aldehydic acid by their capacity to react with thiobarbituric acid (**TBA**) that yields 'thiobarbituric acid reactive substances', (**TBARS**) which can be easily calculated by spectrophotometry. Lipid peroxidation and continuous decadence produce Malondialdehyde (**MDA**) and 4-hydroxy-2-nonenal (**4-HNE**). The most extensively method of estimating free radical activity and lipid peroxidation is to determine the concentration of **MDA**, this is a marker for measuring oxidative stress (**Tangirala Ramasarma *et. al*., 2003**).

Some Methodologies used for studying lipid peroxidation

Component	Method
TBARC	Spectrophotometric, Spectrofluorimetric
Lipid hydro peroxides	Spectrophotometric,
Conjugated dienes	Spectrophotometric,
4-Hydroxynonenal	HPLC
Isoprostanes	HPLC, ELISA
Exhaled gases	GC
Lipid- DNA adducts	Fluorescence

2. Conclusion

Thus, it can be concluded that lipid peroxidation and micronucleus assay are important biomarkers of oral cancer patients and they can be routinely used in high risk groups like tobacco chewers for detection of oral cancer besides other conventional tests. They are useful indicator of oxidative stress and genomic damage as supported by the studies reviewed in this paper.

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