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ANALYSIS OF LIPID PEROXIDATION AND TOTAL ANTIOXIDANT STATUS IN DIFFERENT GRADES OF ORAL SQUAMOUS CELL CARCINOMA

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ABSTRACT:

Background: Cancer, a disease characterized by uncontrolled growth and spread of abnormal cells, is one of the major causes of death in humans Oral squamous cell carcinoma (OSCC) is the sixth most common human cancer.

Aim: The present study is undertaken to assess the levels of antioxidants of Oral squamous cell carcinoma patients.

Methods and Materials: The study group comprised of 51 clinically diagnosed with Oral squamous cell carcinoma, 15 age matched healthy individuals were also investigated as controls. Lipid peroxidation level is estimated using TBA method. Total antioxidant level was estimated using Phosphomolybdenum method. The statistical comparisons were expressed as Mean ± SD. Comparison between the control and different groups were performed by analysis of variance (ANOVA) with Tukey's Multiple Comparison test using Graph pad Prism v3.0 software.

Results: Lipid Peroxidation showed increased in case poorly differentiated carcinoma when compared to control. Total antioxidant level in case normal individual (3.96±1.25) followed by well differentiated (0.64±0.35), moderately differentiated (0.59±0.26) and poorly differentiated carcinoma (0.35±0.28).

Conclusion: The study revealed a difference in the free radical activity and antioxidant capacity in oral squamous cell carcinoma patients and healthy patients which is reflected by the variation in the levels of Lipid peroxidation and total antioxidants.

Keywords: Oral squamous cell carcinoma, Lipid Peroxidation, Total antioxidant.

INTRODUCTION:

Cancer, a disease characterized by uncontrolled growth and spread of abnormal cells, is one of the major causes of death in humans.[1] Oral squamous cell carcinoma (OSCC) is the sixth most common malignancy and a major cause of morbidity and mortality.[2] It is the most common form of cancer affecting males

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and account for 50–70% of all cancers diagnosed in India.[3] The etiology of oral cancer is almost certainly multifactorial, involving many alterations in host immunity, metabolism, angiogenesis and exposure to chronic inflammation in a genetically susceptible individual.[4] Chemicals, virus, irradiation, tobacco, alcohol, hormones, nutrients or physical irritants induce carcinogenic changes which is further influenced by oncogenes and mutation. In patients with head and neck carcinoma, the prognosis is usually predicted based on TNM clinical classification, which is highly useful, specially to assess essential features of cancer, such as local extension, regional dissemination and distant metastasis. Histological grading systems are very significant, once they highlight the histopathological characteristics and the immunological relationship between tumor and host, predicting lesion's behavior through patient's response.[5,6]

Aerobic life is connected with continuous production of free radicals, particularly reactive oxygen species (ROS).[7] Antioxidant defense which deals with the ROS produced as a consequence of aerobic respiration and substrate oxidation also concomitantly exist. Oxidant- antioxidant imbalance resulting in excessive accumulation of ROS is defined as oxidative stress. Oxidative stress is considered to play a key role in tissue damage and promotion of various pathological processes including cancer.[8]

Substantial evidence has established the carcinogenic role of ROS in initiation and promotion of cancer. ROS can cause DNA base alterations, strand breaks, damage to tumor suppressor genes and enhanced expression of protooncogenes. The primary targets of peroxidation by ROS are the polyunsaturated fatty acids in the membrane lipids. The decomposition of these lipids yields a variety of end products such as lipid hydroperoxides (LHP) and malondialdehyde (MDA). The levels of these end products indicate the extent of lipid peroxidation and serve as a marker of cellular damage caused by free radicals.[9]

Antioxidants, on the other hand have a shielding role by scavenging the free radicals and thereby preventing the molecular and physiological damage. The free radicals released by tobacco are known to bring about alterations in antioxidant levels in humans, and these free radical-associated damages are reflected through antioxidant enzyme activities in blood. Thus, it seems that studying biological parameters like antioxidant enzyme system would be of fundamental importance in evaluating the role of tobacco on antioxidant status in smokers and oral pre cancers. [10]

The present study is undertaken to assess the levels of antioxidants of Oral squamous cell carcinoma patients.

MATERIAL AND METHODS:

Blood samples were obtained from 51 0ral cancer patients reported to A.J.Institute of Health Sciences and 15 age matched healthy individuals were also investigated as controls.

They were given detailed information about the research work being carried out and were included in the research study only after obtaining written consent from them.

Ethical clearance certificate was obtained from the institutional Ethical Committee.

Samples were divided into different groups. Group 1: Normal, Group 2: Well Differentiated, Group 3: Moderately Differentiated and Group 4: Poorly Differentiated Squamous cell Carcinoma.

Lipid peroxidation level is estimated using TBA method. Total antioxidant level was estimated using Phosphomolybdenum method.

Statistical analysis: The statistical comparisons were expressed as Mean ± SD. Comparison between the control and different groups were performed by analysis of variance (ANOVA) with Tukey's Multiple Comparison test using Graph pad Prism v3.0 software.

RESULTS:

In our present study we monitored the lipid peroxidation and Total antioxidants capacity in healthy individuals and patients with Squamous cell carcinoma. The general characteristic of patients is given in Table 1.

Table 1: The general characteristic of Subjects

	No. of Subjects
Normal	15
Well Differentiated Squamous cell carcinoma	26
Moderately Differentiated Squamous cell carcinoma	14
Poorly Differentiated Squamous cell carcinoma	11

The first group consists of 15 healthy individuals and the other study group consits of 51 cases of squamous cell carcinoma, out of which 26 cases were well differentiated squamous cell carcinoma, 14 cases were of moderately differentiated squamous cell carcinoma and 11 cases were of poorlydifferentiated squamous cell carcinoma.

Table 2: Estimation of Lipid Peroxidation levels in normal individuals and oral squamous cell carcinoma patients.

	No. of subjects	Mean ±SD	p-value
Normal	15	1.71±0.38	<0.001 vhs
Well Differentiated	26	2.93±0.62	
Moderately Differentiated	14	2.97±0.51	
Poorly Differentiated	11	3.30±0.50	

vhs: Very highly significant

Lipid Peroxidation level in case normal individual is 1.71±0.38 which is lowest followed by well differentiated squamous cell carcinoma with the value of 2.93±0.62,moderately differentiated squamous cell carcinoma with the value of 2.97±0.51 and poorly differentiated squamous cell carcinoma with highest value of 3.30±0.50.All the values are highly significant with the frequency of 24.27.

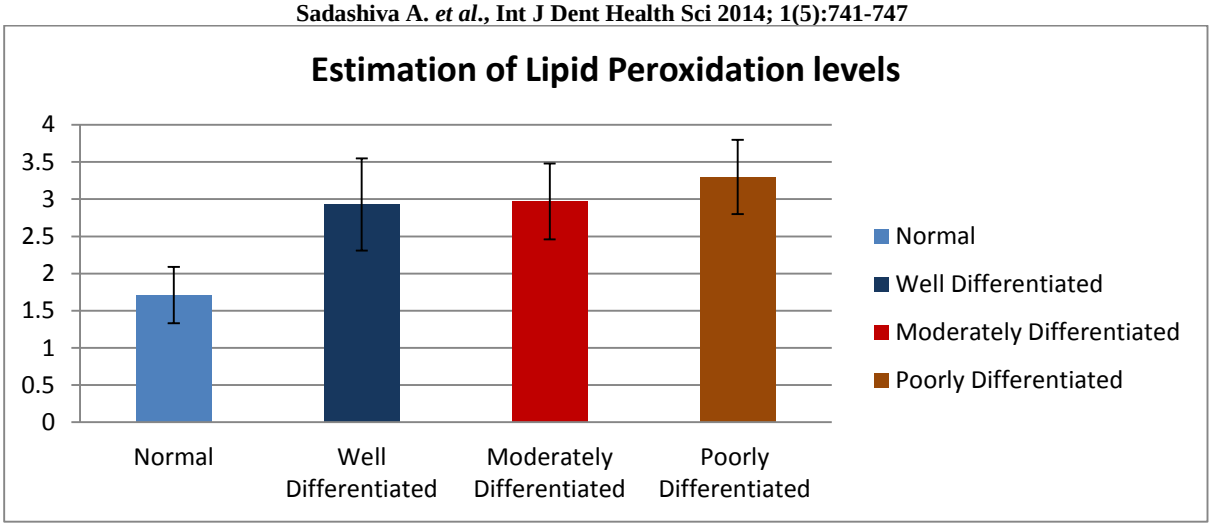

Figure 1: Estimation of Lipid peroxidation level in case of oral squamous cell carcinoma

Table 3: Estimation of Total antioxidant levels in normal individuals and oral squamous cell carcinoma patients.

	No. of subjects	Mean ±SD	p-value
Normal	15	3.96±1.25	<0.001 vhs
Well Differentiated	26	0.64±0.35	
Moderately Differentiated	14	0.59±0.26	
Poorly Differentiated	11	0.35±0.28	

vhs: Very highly significant

Total antioxidant level in case normal individual is 3.96±1.25 which is highest followed by well differentiated squamous cell carcinoma with the value of 0.64±0.35, moderately differentiated squamous cell carcinoma with the value of 0.59±0.26 and poorly differentiated squamous cell carcinoma with lowest value of 0.35±0.28, with the frequency of 102.59.All the values are found to be statistically significant.

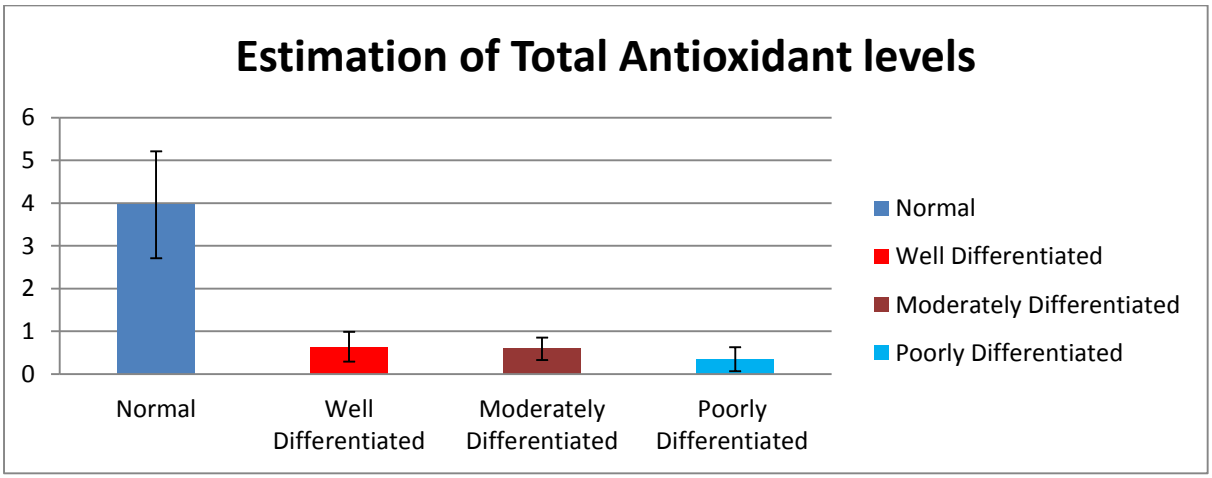

Figure 2: Estimation of Total antioxidant levels in case of Squamous cell carcinoma.

DISCUSSION:

In the present study we analysed Lipid peroxidation and Total antioxidant levels in healthy individuals and patients with Squamous cell carcinoma.

Living organisms have evolved different molecules that speed up termination by catching free radicals and therefore protect the cell membrane. One important such antioxidant is vitamin E. Other anti-oxidants made within the body include the enzymes superoxide dismutase, catalase, and peroxidase. In addition, end products of lipid peroxidation may be mutagenic and carcinogenic . For instance, the end product malondialdehyde reacts with deoxyadenosine and deoxyguanosine in DNA, forming DNA adducts to them, primarily M1G. [11]

Free radicals are electrically charged molecules, i.e., they have an unpaired electron, which causes them to seek out and capture electrons from other substances in order to neutralize themselves. Antioxidants are capable of stabilizing, or deactivating, free radicals before they attack cells. Antioxidants are absolutely critical for maintaining optimal cellular and systemic health and well-being. Hence body maintains complex system of enzymatic antioxidants such as catalase, SOD, peroxidases etc. and non enzymatic antioxidants such as Vit C, E & glutathione etc. Oxidative stress occurs as a result of increased oxidative metabolism.

An inadequate intake of antioxidant nutrients may compromise antioxidant potential, thus compounding overall oxidative stress .Conditions associated with oxidative damage include heart disease, cancer, pulmonary disorders, ageing etc.

An antioxidant is a molecule capable of inhibiting the oxidation of other molecules. Oxidation is a chemical reaction that transfers electrons from a substance to an oxidizing agent.Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactionsthat damage cells. Antioxidants terminate these chain reactions by removing free radicalintermediates, and inhibit other oxidation reactions. They do this by being oxidized themselves,so antioxidants are often reducing agents such as thiols, ascorbic acid or polyphenols. Although oxidation reactions are crucial for life, they can also be damaging; hence, plants and animals maintain complex systems of multiple types of antioxidants, such as glutathione, vitamin C, and vitamin E as well as enzymes such as catalase, superoxide dismutase and various peroxidase. Low levels of antioxidants, or inhibition of the antioxidant enzymes, cause oxidative stress and may damage or kill cells.

Lipid peroxidation refers to the oxidative degradation of lipids. It is the process whereby free radicals "steal" electrons from the lipids in cell membranes, resulting in cell damage. This process proceeds by a free radical chain reaction mechanism. It most often affects

polyunsaturated fatty acids, because they contain multiple double bonds in between which lie methylene -CH2- groups that possess especially reactive hydrogens.

Byproducts of lipid peroxidation cause marked alteration in the structural integrity and function of cell membranes. Lipid peroxidation byproducts formed under physiological and pathological conditions are scavenged by non enzymatic and enzymatic antioxidants. An imbalance between antioxidant defense mechanism and lipid peroxidation processes results in cell and tissue damage.[12-14] Enhanced lipid peroxidation with decline in antioxidants has been reported in venous blood of oral cancer patients and patients with oral squamous cell carcinoma at different intraoral sites.[15,16]

CONCLUSION:

The study revealed a difference in the free radical activity and antioxidant capacity in oral squamous cell carcinoma patients and healthy patients which is reflected by the variation in the levels of Lipid peroxidation and total antioxidants.

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