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Status of serum Sialic acid, Antioxidant and Lipid peroxidation in Head and Neck Cancer patients

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ABSTRACT

Lipid peroxidation is a process where reactive oxygen species degrade poly unsaturated lipids. Malonaldehyde is the end product of lipid peroxidation. Antioxidant systems are capable of removing free radicals, thereby providing protection from free radical attack from destructive molecules. This study was conducted to examine the serum level of the Sialic acid, Total Antioxidant and Lipid peroxidation (Malondialdehyde) in head and neck cancer patients. The present study included blood samples of 50 adult head and neck cancer patients with various clinical changes of oral cancer and 50 age and sex matched healthy subjects. Both control and study group were of same socio-economic status and dietary habits. Serum sialic acid was measured by the method of Winzler and total antioxidant level measured by phosphomolybdenum method and lipid peroxidation (Malondialdehyde) by TBA Method. The level of MDA and Sialic acid was significantly increased ($p < 0.0001$) in the plasma of head and neck cancer patients compared to healthy subjects, whereas the Total antioxidant level was significantly decreased ($p < 0.0001$). The altered lipid peroxidation in plasma /serum of head and neck cancer patients may be related to their compensatory changes in the antioxidant defense system.

Key words: Sialic acid, Lipid peroxidation, Antioxidant, Head and Neck cancer.

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INTRODUCTION

The term head and neck cancer refers to a group of biologically similar cancers originating from the upper aerodigestive tract, including the lip, oral cavity, nasal cavity, paranasal sinuses, pharynx, and larynx. Most head and neck cancers are squamous cell carcinomas (SCCHN), originating from the mucosal lining (epithelium) of these regions [1]. Head and neck cancers often spread to the lymph nodes of the neck, and this is often the first (and sometimes only) manifestation of the disease at the time of diagnosis. Head and neck cancer is strongly associated with certain environmental and lifestyle risk factors, including tobacco smoking, alcohol consumption, UV light and occupational exposures, and certain strains of viruses, such as the sexually transmitted human papillomavirus. These cancers are frequently aggressive in their biological behaviour; patients with these types of cancer often develop a second primary tumour.

During metastasis surface glycoproteins and glycolipids of tumor cells gets altered, which may contribute to aberrant cell-cell recognition, cell adhesion, antigenicity and invasiveness demonstrated by malignant cells. Since sialic acids are major constituents of glycoproteins and glycolipids, recent studies showed that the values of total bound sialic acid or protein-bound sialic acid were higher in patients with cancer than normal subjects. Lipid-bound sialic acid levels are correlated with stage of the disease, degree of metastatic involvement and recurrence of disease [2].

Antioxidant systems are capable of removing free radicals, thereby providing protection from free radical attack from destructive molecules. A disturbance in sialic acid metabolism may lead to an abnormality reflected in sialic acid concentration in blood, urine and solid tissue. This study was conducted to see the serum level of the sialic acid, Total Antioxidant and Lipid peroxidation (Malondialdehyde) in head and neck cancer. Reactive oxygen species (ROS) can function both as initiators and promoters in carcinogenesis. Antioxidants provide protection against cellular and molecular damage caused by ROS. Lipid peroxidation is a process where reactive oxygen species degrade poly unsaturated lipids. Malonaldehyde is the end product of lipid peroxidation.

MATERIALS AND METHODS

The present study included blood samples of 50 adult head and neck cancer patients with various clinical changes of oral cancer and 50 age and sex matched healthy subjects. This work was conducted in the central research laboratory of A.B.Shetty Memorial Institute of Dental Sciences after written consent from the participants and institutional ethical clearance. Both control and study group were of same socio-economic status and dietary habits.

We conducted this study to evaluate the levels of lipid peroxidation product and antioxidant status in patients with head and neck squamous cell carcinoma (HNSCC). Serum sialic acid was measured by the method of Winzler [3] and Total antioxidant level was

measured by phosphomolybdenum method [4] and lipid peroxidation (Malondialdehyde) by TBA Method [5].

The results were analyzed for the statistical significance using Student's t-test and $p < 0.05$ was considered the level of significance.

RESULTS

The present study illustrates the lipid peroxidation, Sialic acid and Antioxidant status in Head and Neck cancer patients by comparing with the normal controls. The results of our study showed that the level of lipid peroxidation (MDA) and Sialic acid was significantly increased ($p < 0.0001$) in the plasma of head and neck cancer patients compared to healthy subjects, whereas the Total antioxidant level was significantly decreased ($p < 0.0001$, Table-1, Fig-1, 2, 3.). The decrease in the total antioxidant might be due to over lipid peroxidation. The cause for the elevated level of Sialic acid might be due to the progressive destruction of cell adhesion.

Table-1: Comparison of Sialic acid, Total antioxidant and MDA level in normal healthy adult controls and Head and Neck cancer patients (Case). Values are Mean \pm S.D. n=50 in each group.

Parameters	Control	Case	P Value
Sialic Acid (mg/dl)	47.88 \pm 17.16	155.2 \pm 17.6	<0.0001
Total Antioxydant (μ g/dl)	110.08 \pm 14.95	83.74 \pm 17.34	<0.0001
MDA (μ M/L)	3.54 \pm 0.09	5.44 \pm 0.74	<0.0001

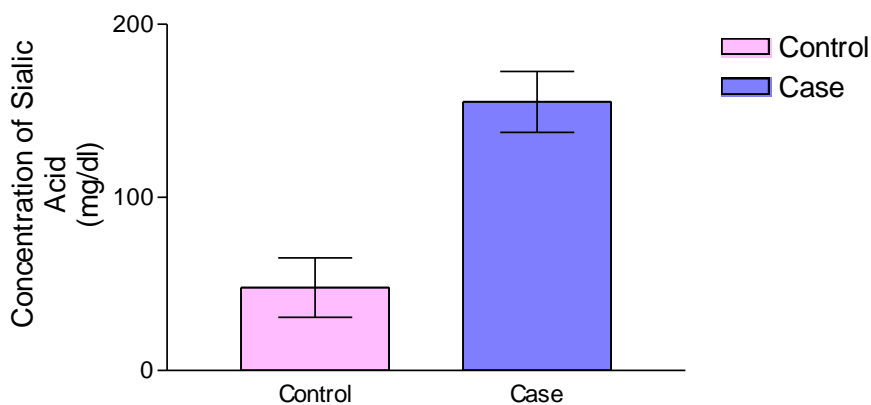


Fig-1. Concentration of Sialic acid in control and Head and Neck cancer Patients

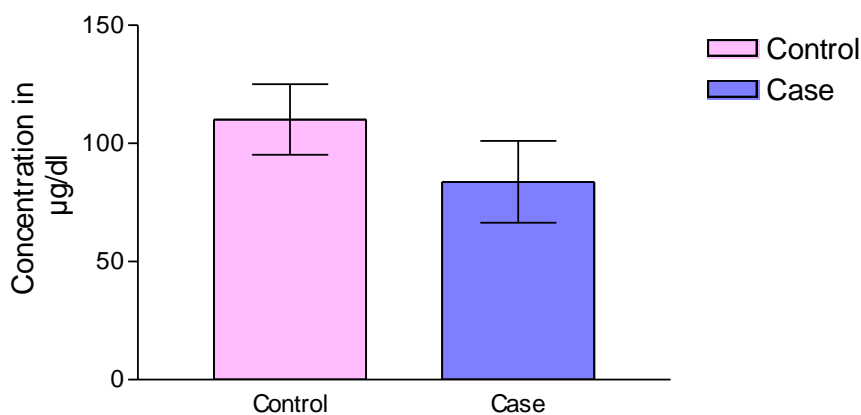


Fig-2. Concentration of Total antioxidant in control and Head and Neck cancer Patients.

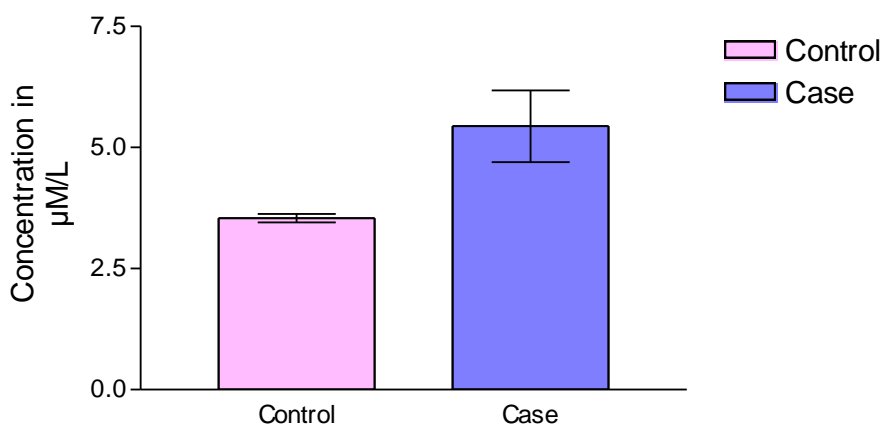


Fig-3. Concentration of Malondialdehyde in control and Head and Neck cancer Patients.

DISCUSSION

Head and neck squamous cell carcinomas (HNSCC's) make up the vast majority of head and neck cancers, and arise from mucosal surfaces throughout this anatomic region. These include tumors of the nasal cavities, paranasal sinuses, oral cavity, nasopharynx, oropharynx, hypopharynx, and larynx.

Sialic acids structurally unique nine-carbon keto sugars occupying the interface between the host and commensal or pathogenic microorganisms. An important function of host sialic acid is to regulate innate immunity. Sialic acids are also excellent sources of carbon, nitrogen, energy and precursors of cell wall biosynthesis. Sialic acids as free or bound to protein as sialoprotein, is secreted by epididymal epithelium and is involved in maintaining the ionic

balance, antigenic interaction between epididymis and spermatozoa, stabilization of plasma and acrosomal membranes of sperm[6]. Sialic acids are typically found as terminal monosaccharide attached to cell surface glycoconjugates. They play many important roles in many physiological activities and pathological processes, including microbe binding that leads to infection, regulation of the immune response, the progression and spread of human malignancies and in certain aspects of human evolution.

Though the mechanism of increased serum SA concentration in malignancies and inflammatory conditions is unclear, several explanations have been proposed. These include, spontaneous release of aberrant SA-containing cell surface glycoconjugates, increased concentrations and/ or glycosylation of normal serum glycoproteins, and secondary inflammatory reactions leading to increased hepatic output of acute phase proteins [7, 8].

Increased levels of ROS could be due to increased production or reduced activity of antioxidant enzymes (Glutathione & catalase). In laryngeal carcinoma it has not been worked out as yet that which is the first stage and how the molecular events get started. In most of the studies Malondialdehyde as a marker of ROS, has been measured, so as to conclude their involvement in laryngeal cancers [9]. In our study the marked elevated levels of serum MDA and declined levels of serum Total antioxidant in head and neck malignancy patients showed high statistical significance ($P < 0.0001$) when Compared with healthy subjects. These high levels of serum MDA and low levels of serum TAS in head and neck malignant individuals directly reflects increased oxidative stress and lipid Peroxidation in them, which might be due to the interaction of various carcinogenic agents, generating free radicals to a greater extent in these patients beyond their defending power or may be due to poor antioxidant system existing in these individuals. Thus measurement of serum MDA and Total antioxidant determines an extent of lipid peroxidation and antioxidant status, in the studied cases that may be helpful in understanding the severity of the disease state a of head and neck malignancies. This altered lipid peroxidation in plasma /serum of head and neck cancer patients may be related to their compensatory changes in the antioxidant defense system.

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