

# Alterations in the Serum Lipid Profile in Patients with Oral Cancer, Oral Precancerous Lesions/Conditions associated with the Habit of Tobacco Consumption

<sup>1</sup>Shilpa Dua, <sup>2</sup>Sonal Vahanwala, <sup>3</sup>Sandeep Pagare

<sup>1</sup>Lecturer, Department of Oral Medicine and Radiology, ITS Dental College, Hospital & Research Center, Greater Noida, UP, India

<sup>2</sup>Professor, Department of Oral Medicine and Radiology, Dr DY Patil Dental College and Hospital, Mumbai, Maharashtra, India

<sup>3</sup>Professor and Head, Department of Oral Medicine and Radiology, Dr DY Patil Dental College and Hospital, Mumbai, Maharashtra, India

**Correspondence:** Shilpa Dua, Lecturer, Department of Oral Medicine and Radiology, ITS Dental College, Hospital and Research Center, Greater Noida, Uttar Pradesh, India, e-mail: sukhjinderkhosa@rediffmail.com

## ABSTRACT

The changes in lipid profile have long been associated with cancer because lipids play a key role in maintenance of cell integrity. Lipids are the major cell membrane components essential for various biological functions including cell growth and division of normal and malignant tissues. Lower blood lipids have been associated with the etiology of breast and colorectal cancer, and relation has also been reported between low cholesterol and increased risk of cancer occurrence and mortality.

The present study was designed to evaluate the serum lipid profile in patients with oral precancerous lesion/condition and squamous cell carcinoma to see whether there are any alterations in the lipid levels during the pathogenesis of these lesions and also to evaluate significance of lipid profile as biochemical marker, if any.

**Keywords:** Serum triglyceride, Serum cholesterol, Serum lipid, Oral precancerous lesions.

## INTRODUCTION

“The more you learn,  
More you come to know  
.....how little you know”

This is so true when one tries to unveil the age-old disease of cancer.

Among the prevalence of most debilitating and devastating disease in India and other Asian countries, oral cancer ranks the sixth most common cancer in the world and has particularly high incidence in Southeast Asian countries, as stated by Johnson (1991); Parkin et al (1997).<sup>1,2</sup> Globally, oral cancer is third most common cancer in males, while in females it ranks fourth.<sup>3</sup>

Lipids are the major cell membrane components essential for various biological functions, including cell growth and division of normal and malignant tissues. It is believed that tobacco carcinogens induce generation of free radicals and reactive species, which are responsible for high rate of oxidation/peroxidation of polyunsaturated fatty acids. These peroxidation further releases peroxide radicals which affect essential constituents of the cell membrane and might be involved in carcinogenesis or tumorigenesis,<sup>4</sup> due to which there is greater utilization of lipids including total cholesterol, lipoproteins and triglycerides for new membrane

synthesis. Cells fulfill these requirements either from circulation, by synthesis through metabolism or from degradation of major lipoprotein fractions like high-density lipoprotein cholesterol, low-density lipoprotein cholesterol and very low-density lipoprotein cholesterol.<sup>4</sup>

## AIMS AND OBJECTIVES

- To evaluate serum lipid profile in patients with oral cancer, oral precancerous lesions/conditions associated with the habit of tobacco consumption in any form and its comparison with the lipid profile among control groups
- To evaluate serum lipid profile in patients having the habit of tobacco consumption in any form but without any lesions present and its comparison with the lipid profile among control groups
- To assess whether the levels of serum lipid profile alter during the pathogenesis of oral cancer and oral precancerous lesions or conditions
- To assess whether the levels of serum lipid profile alter in individuals with the habit of tobacco in any form but without any lesions when compared with the controls
- To assess whether such altered levels of serum lipid, if any could be used as a biochemical marker for oral cancer and oral precancerous lesions/conditions.

## MATERIALS AND METHODOLOGY

The study group consisted of 60 individuals and the control group consisted of 30 individuals.

### Study Group

Inclusion criteria	Exclusion criteria
Individuals having habit of tobacco (smoking, chewing or snuff)	Individuals suffering from diseases that can alter the lipid profile (diabetes mellitus, uremia, nephritic syndrome, hypothyroidism, hyperthyroidism and acromegaly)
Individuals having clinically and histopathologically confirmed oral leukoplakia, oral submucous fibrosis and oral squamous cell carcinoma	Individuals on lipid lowering drugs
	Women on oral contraceptives.
	Individuals not fit for biopsy or failing to give their consent

Study group consisted:

60 individuals → Habit of tobacco with oral leukoplakia, oral submucous fibrosis or oral squamous cell carcinoma → 30 of maxilla/mandible  
Habit of tobacco consumption but → 30 without any lesions

30 individuals → control group → without habit of tobacco and with good systemic health

- Individuals of the study group were clinically examined for oral leukoplakia, oral submucous fibrosis and oral squamous cell carcinoma of maxilla/mandible
- The findings were recorded on a custom-made case history proforma
- The study group having oral leukoplakia and oral submucous fibrosis were selected based on the clinical criteria explained by Southam<sup>5</sup> and Daftary DK<sup>6</sup> respectively. Carcinoma patients were selected using clinical criteria explained by Neville, Dam, Allen et al<sup>7</sup>
- For serum lipid profile analysis, minimum 12 hours fasting blood samples were obtained from each individual of the study group as well as control group
- This analysis was carried out at the Pathology Department of Dr DY Patil Medical Hospital, Nerul, Navi Mumbai, using fully automated biochemistry analyzer machine—'Dade Behring'.

## RESULTS

For the convenience of tabulation, the study sample was divided as follows:

- Group I* Patients with oral precancerous lesions/conditions and oral squamous cell carcinoma, associated with the habit of tobacco in any form (study group).
- Group II* Patients with the habit of tobacco in any form but without any lesions (study group).
- Group III* Patients without the habit of tobacco and without lesions.

## RESULTS INFERENCE

### Gender Distribution

Sr no	Groups	Males	Females
1.	I	70%	30%
2.	II	73.33%	26.7%
3.	III	56.67%	43.33%

In patients with oral cancer, habit of gutka chewing was more prevalent (~35%) followed by beedi smoking (~25%) and chewing tobacco with lime (~25%). Habit of cigarette smoking was seen exclusively in this group as compared with patients with oral precancerous lesion/condition.

In patients with oral precancerous lesion/condition, habit of gutka chewing and chewing of tobacco with arecanut (~26%) was seen to be more prevalent (Fig. 1).

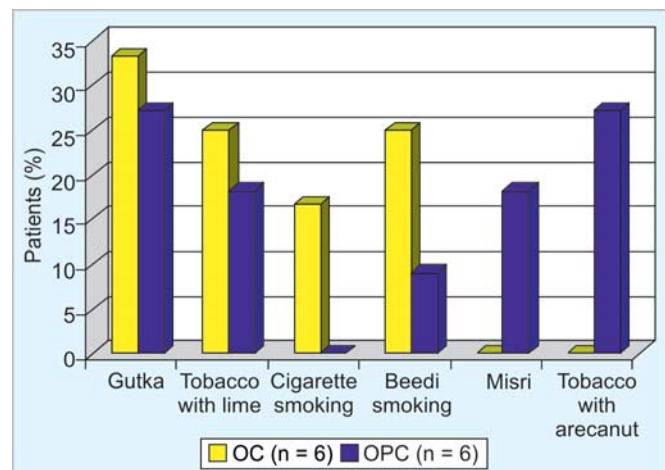


Fig. 1: The prevalence (%) of patients with different tobacco chewing habits

### Mean Values of Five Parameters of Serum Lipid for Three Groups

Groups	Serum triglyceride	Serum cholesterol	HDLC	LDLC	VLDLC
Group I	109	166.2	41.27	98.9	21
Group II	134	162	43.57	91.63	26
Group III	118.1	162.4	34.7	104.3	23

- The levels of serum cholesterol, high-density lipoprotein cholesterol (HDL) and low-density lipoprotein cholesterol (LDL) were statistically significantly lower in patients with oral cancer (OC) when compared with the levels of patients with oral precancerous lesion/condition (OPC)
- The levels of serum triglyceride, serum cholesterol, HDL and very low density lipoprotein cholesterol (VLDL) were statistically significantly lower in patients with OC when compared with the levels of patients without the habit of tobacco consumption without any lesions (group III)
- The level of HDL was statistically significantly higher in patients with oral precancerous lesion/condition when compared with the levels of patients without the habit of tobacco consumption without any lesions (group III)
- The level of HDL in patients with the habit of tobacco consumption in any form but without lesions (group II) was statistically significantly higher when compared with the controls (group III).
- Decreased synthesis of  $\alpha_1$ -lipoprotein and cholesterol by liver as the synthesis is affected by tumor metabolites
- Antibodies to lipoproteins which could lead to accelerated immune elimination of antigen-antibody complex.  
In neoplastic tissue, an increased low-density lipoprotein receptor activity in tumor cells may produce hypocholesterolemia.<sup>15</sup>

S Desai et al<sup>16</sup> proposed that free cholesterol within the tumor cells, is preferentially channeled into storage as cholesterol esters rather than being released from the cells to circulating HDL. This happens irrespective of whether the free cholesterol is arising from synthesis or uptake in the tumor cells. This mechanism explains the decreased levels of HDL in cancer patients.

In accordance with the above-mentioned studies, the present study shows declined serum levels of total cholesterol, HDL, VLDL and triglyceride in patients with oral cancer as compared with that of controls. The results of the study add to the evidence of an inverse relationship between lower serum lipid profile and oral cancer. The levels of serum cholesterol, HDL and LDL were declined in patients with oral cancer when compared with the levels in patients with oral precancerous lesions/conditions. Thus, it can be stated that the lower serum lipid status may be a useful indicator, i.e. biochemical marker for initial changes occurring in neoplastic cells.

## DISCUSSION

It is estimated that about 9 million new cases of cancer are diagnosed every year and over 4.5 million people die from cancer each year.<sup>8</sup> Cancer of oral cavity is one of the commonest cancers among males<sup>9</sup> and sixth most common cancer in the world. Phospholipids and cholesterol have been reported to undergo early and significant changes in certain types of malignant tumors. The process of carcinogenesis could be responsible for low levels of cholesterol in the proliferating tissues and in the blood compartments.<sup>10</sup>

In a study conducted by Fu-Chuan Chao et al,<sup>11</sup> it was stated that hypolipidemia is a result of direct lipid lowering effect of tumor cells as these neoplastic cells directly utilize cholesterol for their own metabolism. The profound effect of hypolipidemia should be recognized and an early measure should be made to restore cholesterol levels to avoid conditions that may hasten morbidity and mortality in cancer patients.

In another study conducted by Min-Ah Choi et al,<sup>12</sup> it was suggested that hypocholesterolemia was secondary to decreased levels of serum antioxidative vitamins. Decrease in the level of antioxidative vitamins in serum results in increased number of free radicals which causes increased lipid peroxidation.

Schatzin et al<sup>13</sup> and Choyu et al<sup>14</sup> have observed an inverse trend between lower serum cholesterol level and head, neck as well as esophageal cancer.

The results are strengthened by the present study which also shows lower serum levels of triglycerides, total cholesterol, HDL and VLDL in patients with oral cancer when compared with controls.

According to Nydegger et al,<sup>10</sup> the observed decrease in lipoprotein and cholesterol levels was possibly due to:

- Increased catabolism of  $\alpha_1$ -lipoprotein and cholesterol

## CONCLUSIONS

The study concludes that:

- The habit of tobacco consumption was more prevalent among male patients than female patients in both the groups, i.e. I and II, with habit of gutka chewing and chewing of tobacco with arecanut (~26%) being more prevalent
- The levels of serum cholesterol, HDL and LDL were statistically significantly lower in patients with OC when compared with the levels of patients with OPC
- The levels of serum triglyceride, serum cholesterol, HDL and VLDL were statistically significantly lower in patients with OC when compared with the levels of patients without the habit of tobacco consumption without any lesions (group III)
- Altered lipid profiles in the form of elevated HDL levels were observed in patients with the habit of tobacco in any form but without any lesions when compared with the controls thereby; suggesting that tobacco consumption in any form has an adverse effect on lipid profile
- The serum lipid levels were statistically significantly lowered in patients with oral cancer when compared with the normal control group. Hypolipidemia was found to be associated with oral cancer patients when compared with normal control group. Thus, hypolipidemia can be considered as a one of the biochemical marker in early detection of cancer.

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