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Role of Serum Lipid Profile;
Indicator of Early Changes in Head and Neck Cancer Cells

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Objective: The objective of this study was to investigate the role of serum lipid profile as an indicator of early changes in head and neck cancer cells and to assess the potential value of these changes in detecting neoplastic cell alterations at an early stage.

Methodology: The Hospital-based case-control study was carried out on 48 patients with newly diagnosed Head & Neck malignancies, attending the Department of Otorhinolaryngology and Head and Neck Surgery Pakistan Institute of Medical Sciences Islamabad between July 2020 and December 2020. Forty-eight Age and sex-matched who did not have any renal, hepatic or cardiac dysfunction were taken as controls. Fasting blood samples were drawn and analyzed for lipid profile as recommended in the literature.

Results: A significant change in plasma lipid profile with P values of Total Cholesterol (0.000), Triglyceride (0.004), and HDL (0.009) of <0.05 indicates that there is a statistically significant reduction of mean serum Total Cholesterol, Triglyceride, and HDL in subjects with head and neck cancer compared to the control group.

Conclusion: The altered plasma lipid status observed in this study suggests its potential as a valuable signal for early alterations in neoplastic cells associated with head and neck malignancies. Furthermore, a comprehensive review focusing on cholesterol-carrying lipoprotein transportation and the efficacy of receptor systems may contribute to a better understanding of the underlying mechanisms controlling plasma cholesterol concentration in the context of cancer.

Keywords: Cholesterol, Head and Neck Malignancy, Lipid Profile, Triglycerides.

Introduction

Lipids are a necessary component of human body cells and play an important role in the formation of cell membranes in all cell types. They are also necessary for a variety of biological tasks, including normal cell proliferation and the formation of malignant cells. Many studies have been conducted to investigate the use of serum lipid profiles in the diagnosis and treatment of different disorders. Lipid levels are altered in certain malignancies because rapidly multiplying cancer cells increase demand, resulting in a decrease in blood cholesterol levels. Furthermore, several studies have linked low blood cholesterol levels to elevated cancer risk development and mortality. Although alteration of the lipid profile is seen in various cancers, the exact pathogenesis of it is not reaffirmed in cancers as its prime role in the pathogenesis of coronary artery disease.

Lipids are an essential constituent of our body cells, as they play an integral part in forming the cell membranes of almost all the cell types, as seen in the lipid bilayer model. They are also important for numerous biological and biochemical functions, including the cell growth of normal and malignant cells. Variation in serum lipid

profile has been seen in many conditions, and its usefulness in diagnosing and treatment has been studied in various studies.[1] Lipids have a significant role in cell integrity, and lipid alteration can be associated with cancers. Multiple carcinogens are thought to produce free radicals and reactive oxygen species, which cause polyunsaturated fatty acids to oxidise and peroxide.[2] Plasma lipid profile is made up of triglycerides (TGS), low-density lipoprotein (LDL), and high-density lipoproteins (HDLs)-cholesterol. Lipids are carried in body fluids by lipoproteins. Several malignancies have lower blood cholesterol levels. Increased demand causes a reduction in blood cholesterol levels as a result of quickly multiplying cancer cells.[3] Conversely, some researchers have also linked low levels of serum cholesterol to a heightened likelihood of getting cancer and dying from all this.[4,5] Although different malignancies exhibit abnormal lipid profiles, their primary contribution to the pathogenesis of coronary artery diseases is not established in cancers. Several studies looked at lipid profile changes in malignancies and precancerous situations and discovered a lower lipid profile in individuals with head and neck cancer.[6]

Head and neck cancers are one of the main causes of death and morbidity worldwide, but their prevalence is unquestionably higher in South East Asia than in the West. Because of the continual cycling of lipids in and out of the circulation, plasma lipid content is more than merely an additive function of intake, utilisation, and production. The question of whether a change in lipid profile at the time of diagnosis is a cause or an effect of cancer remains unsolved.[7] The key to managing any malignant illness is early identification, and the quest for molecular markers in bodily fluids for diagnosing cancer has not stopped.[8] Tumor markers are molecules in the blood that change quantitatively throughout tumour progression. If biochemical changes occur before cancer develops, it can help predict whether a certain individual will acquire cancer later in life. Body fluids such as saliva, blood, urine, and others are utilised for early diagnosis, prognosis prediction, and illness progression monitoring. A variety of biochemical indicators are available for the diagnosis of potentially malignant illnesses, with the serum lipid profile being one of the most relevant. Blood-based tests are more appealing due to their ease of use, low cost, non-invasiveness, and ability to sample many times.[9] With these questions in mind, the following study sought to assess the plasma lipid profile in patients with head and neck cancer.

Methodology

The study was conducted as a prospective observational between July 1st and December 31st, 2020, at the Department of Otorhinolaryngology and Head and Neck Surgery, Pakistan Institute of Medical Sciences, Islamabad. A total of 48 patients with newly diagnosed head and neck malignancies, confirmed through histological examination, were enrolled in the study. To ensure a homogeneous study population, individuals who were obese or had a medical history of hypertension, diabetes, coronary artery disease, myocardial infarction, cardiac, renal, or hepatic dysfunction, those undergoing chemotherapy or radiation, and those using lipid-interfering medications were excluded from the study. In order to establish a suitable control group, 48 patients with no renal, hepatic, or cardiac failure were included. Following the recommended protocols described in the existing literature, fasting blood samples were collected from all participants and analyzed to determine their lipid profile.

The collected blood samples were analyzed to determine the lipid profile. This analysis included measuring parameters such as total cholesterol, triglyceride, low-density lipoprotein (LDL), and high-density lipoproteins (HDL). The analysis was performed using established laboratory techniques.

Relevant clinical data were collected from the participants, including demographic information, age, medical history, and details of the malignancy, such as the site and histopathological characteristics.

Results

Among the 48 patients included in this study with Head and Neck malignancy, 13 (27.1%) were females and 35 (72.9%) were males. The age range of the sample population was 14 to 80 years, with a mean age of 52.06 ± 15.22 years. The largest proportion of cases, 16 (33.3%), fell within the age group of 51–60 years, followed by 11 (22.9%) cases in the age group of 61-70 years. There were 4 (8.3%) cases in the age group above 70 years, and a small number of cases, 2 (4.2%), were below 20 years of age.

Out of 48 cases, the most common site involved was the Oral cavity at 37.5% (n=18) followed by the Larynx 33.3% (n=16) and the least common was the Parapharyngeal space malignancy at 2.1% (n=1). The tongue was the most prevalent place in the oral cavity, preceded by the buccal mucosa. The glottis was the most

prevalent place in the larynx. Squamous cell carcinoma was the most prevalent kind of cancer in our study, accounting for 85.4% (n=41), with the remainder being different varieties. Histopathologically, 29.2% (n =14) of the patients had been highly differentiated, 27.1% (n =13) were moderately differentiated, 14.6% (n=7) had poor differentiation, and 14% (n=29.2) were undifferentiated.

The intergroup comparison of serum lipid profile levels amongst different degrees of differentiation revealed no significant connection between serum lipid profile and degrees of differentiation. Tables show the mean blood lipid profile values of patients with head and neck cancer and control groups (5 & 6). Total Cholesterol (0.000), triglycerides (0.004), and HDL (0.009) P values of 0.05 indicate that there is a statistically significant drop in mean serum Total Cholesterol, triglycerides, and HDL in participants with head and neck cancer compared to the control group. LDL levels in persons with head and neck

cancer do not demonstrate a significant drop when compared to the control group (P > 0.05), i.e. (0.08). Out of 48 cases of head and neck cancer, 90% had consumed tobacco in some form or another. Tobacco in the form of cigarette smoking was common among male subjects, while the habit of snuff was usually observed in the female subjects.

Discussion

The majority of cases in our study, comprising 16 individuals (33.3%), fell within the age group of 51-60 years. Conversely, the lowest number of cases, specifically 2 individuals (4.2%), were below 20 years of age. A study conducted at Gandhi Medical College and Hamidia Hospital in Bhopal, India, reported a maximum number of patients within the age range of 41-60 years. Similarly, Patel et al. observed a higher number of patients in the age group of 30-60 years, while Chawda et al. documented a greater prevalence of patients in the age range of 30-75 years.[7, 10, 11] The findings of our study align with the aforementioned research, as the majority of our patients were within the age group of 31-70 years (56.2%). The male-to-female ratio in our study was 2.69:1, which is consistent with the previously mentioned studies where Patel et al. and Chawda et al. reported a higher incidence of head and neck cancers in males, with male-to-female ratios of 1.3:1 and 1.14:1, respectively.[7, 10, 11]

Most of the studies show male predominance which might be the case due to increased use of tobacco in males as some people are in a habit of using multiple forms of tobacco at a time. Out of 48 cases the most common site involved was the Oral cavity 37.5% (n=18); according to a study carried out by Bhurgri et al, a total of 233 cases were reported for the years 1995-96 in the district south Karachi.[12] In our study, the most common malignancy was squamous cell carcinoma at 85.4% (n=41) and the remaining were of other types. Around

Table I: Site Distribution of head and neck; grade of differentiation; and stage of tumor

Site	Frequency	(%)
Hypopharyngeal	4	8.30
Larynx	16	33.30
Nose & Nasopharynx	3	6.30
Oral Cavity	18	37.50
Parotid	2	4.20
Parapharyngeal	1	2.10
Thyroid	4	8.30
Total	**48**	**100.00**
Well-differentiated	14	29.20
Moderately differentiated	13	27.10
Poorly differentiated	7	14.60
Other	14	29.20
Total	**48**	**100.00**
Stage I	25	52.1
Stage II	15	31.3
Stage III	5	10.4
Stage IV	3	6.3
Total	**48**	**100.0**

Table II: Comparison of Lipid Parameters in Control and Cancerous Group

	Minimum (Control)	Minimum (Cancerous)	Maximum (Control)	Minimum (Cancerous)	Mean (Control)	Mean (Cancerous)	SD (Control)	SD (Cancerous)
Cholesterol	175	155	220	199	197.04	177.29	8.51	12.09
HDL	35	25	47	131	40.72	41.83	2.81	18.20
LDL	99	35	128	413	106.97	108.94	7.70	54.62
Triglycerides	100	32	147	273	117.00	118.23	13.42	50.78

Table III: Comparison between Control and Cancerous groups

LIPID PARAMETERS	Control	Cancerous	P-Value
Cholesterol	197.04±8.51	177.29±12.09	0.000
Triglycerides	117.00±13.42	118.23±50.788	0.004
HDL	40.72.83±2.81	41.83±18.20	0.009
LDL	106.97±7.70	108.94±54.62	0.08

29.2% (n = 14) of the patients were histopathologically graded as well differentiated, 27.1 % (n =13) moderately differentiated, 14.6 % (n = 7) of the cases with poor differentiation and 14 % (n =29.2) are undifferentiated which is in accordance to the studies carried out by Patel et al and Kumar et al. where well-differentiated carcinomas were (94.6 %) and (70 %) respectively.[11,13] Our study is also under Patel et al and Lohe et al in having no statistical significance in serum lipid profile with tumour differentiation.[11,14] The mean serum lipid profile value for TC, TG and HDL in this study shows P < 0.05 that is, Total Cholesterol (0.000), TG (0.004) and HDL (0.009) in the head and neck malignancy cases as compared to control group. LDL did not show any statistical significance which is by various studies have shown an inverse association between blood lipid profile and head and neck cancers.[10,11,14]

Cholesterol and triglycerides are crucial cell elements that are required to perform various vital physiologic tasks. Cholesterol is required for the structural and functional integrity of cellular membranes. Lipoprotein receptors on the cell's surface are responsible for cellular absorption and control of cholesterol. Triglycerides and cholesterol are bundled into lipoproteins for transit in plasma, where they are taken up and destroyed by cells to meet cellular function demands. Blood cholesterol levels alter rapidly and significantly in some cancers. Low levels of cholesterol in growing tissues and blood compartments might be caused by the carcinogenesis process. Is the question if hypolipidemia is a risk factor or a symptom of cancer? However, previous research has suggested that hypolipidemia may originate from the direct lipid-lowering impact of tumour cells or from a subsequent breakdown of lipid metabolism or from antioxidant vitamins. Numerous prospective and retrospective investigations have revealed an inverse relationship between blood lipid levels and various malignancies. The current study shows decreased plasma total cholesterol, HDL, and triglycerides in individuals with head and neck cancer.

Conclusion

Finally, changed plasma lipid condition could be a valuable signal of early alterations in neoplastic cells. To gain a comprehensive understanding of these intriguing findings, additional research efforts and in-depth investigations focused on lipoprotein transport and receptor systems are warranted. Such studies would contribute to advancing our knowledge of the role of lipid metabolism in cancer and could potentially lead to the development of targeted interventions for cancer prevention and treatment.

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