

**Estimation of Inflammatory Markers and Iron Metabolism in Patients with Oral Cancer as Prognostic Factor: A Case Control Analysis**Hitesh Anadkat<sup>1</sup>, Bimal Patel<sup>2</sup>, Jaydeep Gorani<sup>3</sup><sup>1,3</sup>Assistant Professor, Department of Pathology, Gujarat Adani Institute of Medical Sciences, Bhuj, Kutch, Gujarat, India<sup>2</sup>Associate Professor, Department of Pathology, Gujarat Adani Institute of Medical Sciences, Bhuj, Kutch, Gujarat, India

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Conflict of interest: Nil

**Abstract:****Background and Aim:** Understanding the changes in iron concentration in the serum of oral cancer patients can be valuable for early diagnosis, treatment decisions, and prognosis. This study was planned to assess the role of serum iron, ferritin, and CRP as diagnostic and inflammatory markers in malignancies of the Head and Neck. In addition, the study aimed to assess the relationship between these markers.**Material and Methods:** This study is a case control analysis conducted in the pathology department in collaboration with the oncology department at the medical college and associated hospital. The study population includes 100 individuals recently diagnosed with Head & Neck cancer who meet the specified criteria, as well as 100 healthy individuals of similar age and sex for the control group. Parameters of chronic inflammation [CRP], as well as iron metabolism (iron, ferritin), were measured in all patients. The malignant diseases were confirmed through histopathological examination.**Results:** The study included 120 males and 80 females. In group 2, the serum levels of CRP were found to be significantly higher compared to the control group. Group-2 had a noticeably lower serum level of iron compared to the control group.**Conclusion:** Chronic inflammation is a significant factor in the development, advancement, and spread of cancer. CRP is a marker that can indicate the presence of various diseases and inflammation in the body.**Keywords:** Chronic inflammation, CRP, Iron Metabolism, Oral Cancer.

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**Introduction**

Cancer is a significant health issue and a leading cause of death worldwide. If we can implement effective preventive measures, we have the potential to slow down and even reverse the alarming rise in cancer cases worldwide. [1,2]

It is important to have biological prognostic indicators that can help identify disease recurrence and guide further treatment after local therapy. Efforts are being made to gain a better understanding of the immunological aspects of Head & Neck cancer through extensive studies, with the aim of identifying a specific biological marker. [3,4]

Understanding the changes in iron concentration in the serum of oral cancer patients can be valuable for early diagnosis, treatment decisions, and prognosis. Understanding iron metabolism is crucial for preserving the well-being of oral mucosa. Numerous diseases, such as cancers, can be linked to a deficiency in iron. The progression of

oral cancer can be predicted by the serum iron content. There seems to be a connection between the levels of Serum Iron and the development of oral Carcinogenesis. [5,6]

Ferritin is a significant iron storage protein that has been identified in human tissues. Malignant cells often exhibit abnormal production of ferritin, both in terms of quality and quantity. Serum ferritin is expressed significantly in tumour tissues. High levels of serum ferritin can be seen in various infectious diseases and rheumatic disorders, and can also serve as an important indicator of cancer. [7,8]

CRP is an acute-phase protein that serves as a marker for inflammation. Proinflammatory cytokines like interleukin-6, interleukin-1, and tumour necrosis factor can regulate the synthesis of CRP in hepatocytes. This protein is then released into the bloodstream within a few hours after tissue injury, indicating infection or inflammation. [9]

Similar patterns have been observed in various types of malignancies. This study was planned to assess the role of serum iron, ferritin, and CRP as diagnostic and inflammatory markers in malignancies of the Head and Neck. In addition, the study aimed to assess the relationship between these markers.

### Materials and Methods

This study is a case control analysis conducted in the pathology department in collaboration with the oncology department at the medical college and associated hospital. The study was conducted over a span of 18 months. The study was conducted after obtaining approval from the Institutional Ethics and obtaining informed consent from the patients before enrolling them in the study.

The study population includes 100 individuals recently diagnosed with Head & Neck cancer who meet the specified criteria, as well as 100 healthy individuals of similar age and sex for the control group.

The study included individuals above 18 years of age, of any gender, who were newly diagnosed with Head & Neck Cancer. Only patients who were willing to participate and sign the consent document were included. The study excluded certain individuals based on specific criteria. These criteria included cancer patients who had undergone surgery, patients with other chronic diseases, cancer patients undergoing chemotherapy and radiotherapy, individuals who had been taking mineral supplements for an extended period of time, patients with acute infections, individuals with a history of other malignancies, those with a history of blood transfusion, individuals with ear,

nose, or throat infections, patients with anaemia or taking iron supplements, and individuals on drug therapy that could potentially affect the study's results. Included in the study were only those patients who expressed a willingness to participate.

Parameters of chronic inflammation [CRP], as well as iron metabolism (iron, ferritin), were measured in all patients. We conducted routine analyses of Hb, CRP, serum iron, and ferritin. The malignant diseases were confirmed through histopathological examination. A 2-ml blood sample was collected from each subject using the standard venipuncture technique in a sterile environment. The blood samples were processed through centrifugation to separate the serum. CRP levels were then determined using immunoturbidimetry, while iron metabolism was measured using an electrochemiluminescence immunoassay in human serum and plasma.

### Results

There were a total of 200 patients included in the study. They were split into two groups: Group 1 includes 100 individuals who are in good health, while group 2 consists of 100 patients who have been diagnosed with oral cancer and have been confirmed through histopathological analysis. The age range of the patients included in this analysis spanned from 22 to 78 years. The average age was determined to be  $46.87 \pm 11.98$  years. The study included 120 males and 80 females.

In group 2, the serum levels of CRP were found to be significantly higher compared to the control group. Group-2 had a noticeably lower serum level of iron compared to the control group. (Table 1 and 2)

**Table 1: comparison of CRP levels in different study groups**

Groups	CRP level
Group 1	$4.23 \pm 6.23$
Group 2	$37.92 \pm 38.01$

**Table 2: Comparison of Iron metabolism in different study groups**

Groups	Serum Iron
Group 1	$100.73 \pm 21.51$
Group 2	$69.12 \pm 18.61$

### Discussion

The rapid spread of oral cancerous lesions is a cause for concern. The presence of clinical markers in the oral cancer lesion aids in its diagnosis. Chewing areca nut is a major contributor to the development of oral cancers.

Oral cancer is caused by different carcinogens found in tobacco and related products, such as polynuclear aromatic hydrocarbons and nitrosamines. In this study, we aimed to compare and correlate the serum levels of iron and CRP with

various haematological parameters in patients with oral cancer and controls. [10] Our study found that the majority of patients fell into the older age group, with ages ranging from 40 to 76 years. Oral malignancies tend to occur more frequently in adults, typically in their 50s and 60s, as a result of the higher presence of risk factors like tobacco and alcohol, as stated by Radhakrishnan et al. [11] Our study consisted of 120 male patients (66.7%) and 80 female patients (33.3%). George et al found that PMDs are more commonly observed in males, which may be attributed to their higher rates of

tobacco and alcohol consumption. In the current study, patients in groups II and III exhibited elevated serum CRP levels, along with symptoms like pain and burning sensation. A study was conducted by Oliveira et al to investigate the correlation between inflammatory markers and perceived pain in patients with head and neck cancer (HNC) before starting anticancer treatment. Patients who are in pain showed significantly elevated levels of CRP ( $P < 0.01$ ) and TNF- $\alpha$  ( $P < 0.05$ ) in comparison to the control group and asymptomatic patients. This indicates a noteworthy correlation between pain and CRP levels. In the present study, it was found that the serum iron levels in group-I were significantly lower compared to the control group. Guruprasad R et al. stated that the decrease in serum iron levels was a result of its utilisation for collagen synthesis. [12]

### Conclusion

Chronic inflammation is a significant factor in the development, advancement, and spread of cancer. CRP is a marker that can indicate the presence of various diseases and inflammation in the body. The study indicates that oxidative stress and trace elements play a role in changing the haematological parameters and in the development of oral cancer. Further research is needed to include a larger number of participants in order to evaluate the biomarkers for the prognosis and follow-up treatment of oral cancer.

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