Original Research

Assessment of biochemical factors in blood serum of patients with oral squamous cell carcinoma

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Abstract
Aim: To evaluate biochemical factors in the blood serum of patients with oral squamous cell carcinoma to identify potential biomarkers for diagnosis and prognosis.
Materials and methods: This descriptive analytical study was conducted on patients diagnosed with oral squamous cell carcinoma (OSCC) with no prior treatments or tumor recurrence. Demographic and clinical data, including age, sex, diet, place of residence, smoking status, alcohol consumption, and site of oral involvement, were recorded. Blood samples (20 mL) were collected and analyzed for serum levels of iron, copper, selenium, folate, Vitamin B12, and homocysteine, while cancer staging was performed by a surgeon. Serum levels of biochemical factors across different clinical stages of OSCC were compared using SPSS software (Version 20). The Chi-square test evaluated the relationship between demographic factors and biochemical serum levels, with statistical significance set at $P < 0.05$. Archival data were used for TNM staging.
Results: The study included 25 patients, with 52% male and 48% female participants. The mean age of the patients was 54.62 ± 12.32 years. Regarding systemic diseases, 20% had hypertension, 24% had diabetes, 8% had cardiovascular diseases, and 4% had renal insufficiency. Additionally, 24% had a history of cigarette smoking, while 32% had a history of alcohol consumption. The mean serum levels and standard deviations (SD) of various metabolites were as follows: Iron had a mean of 72.1 ± 21.63 ng/dl, Copper 94.33 ± 23.58 ng/dl, Vitamin B12 70.46 ± 24.66 ng/dl, Selenium 265.38 ± 53.08 ng/dl, Folic acid 9.07 ± 3.63 ng/dl, and Homocysteine 23.40 ± 7.02 ng/dl.
Conclusion: The study provides insights into the serum levels of key metabolites in OSCC patients, suggesting their potential role in the disease's development and progression.
Keywords: carcinoma, serum, selenium

Introduction

Oral Cavity Squamous Cell Carcinoma (OCSCC) is the most common cancer within Head and Neck Cancer (HNC), ranked 16th globally and known for its aggressive nature, high recurrence, and metastatic potential. It has an incidence ranging from 1% to 4% in Western countries, with higher prevalence in unindustrialized Asian regions, where it is linked to higher mortality. The global burden of OCSCC is 3.90/100,000, with a mortality rate of 1.94/100,000. The 5-year survival rate varies significantly, from 83% in early stages to 38% in advanced stages. OCSCC presents in various histological forms, including verrucous carcinoma, squamous basaloid cell carcinoma, spindle cell carcinoma, adeno-squamous carcinoma, and adenoid squamous carcinoma, each with different aggressiveness and tendencies for relapse and metastasis.[1,2,3,4]

Recent research into the etiology of oral squamous cell carcinoma (OSCC) has underscored the impact of various vitamins and minerals on the disease's development. Deficiencies in folate and Vitamin B12 are major contributors to elevated serum homocysteine levels, which are linked to DNA damage and disrupted gene methylation, promoting tumor growth.[5] Folate plays a crucial role in DNA metabolism and repair, with both its deficiency and excess potentially altering gene expression and influencing tumor progression. Copper, a trace element integral to several proteins, is found in elevated concentrations in cancer cells, where it supports tumor growth and angiogenesis. Selenium, an essential nutrient, provides protection against carcinogenesis and tumor progression by inhibiting cell invasion and angiogenesis.[6,7] Additionally, iron, important for cellular metabolism, may have altered

levels in cancer. While the relationships between these micronutrients and OSCC are still being explored, evidence suggests that serum levels of folate, Vitamin B12, homocysteine, copper, and selenium play a role in the onset and progression of the disease.[8] Nonetheless, further research is needed to clarify the definitive connections between these serum levels and OSCC.

In this study we aimed to evaluate biochemical factors in the blood serum of patients with oral squamous cell carcinoma to identify potential biomarkers for diagnosis and prognosis.

Material and methods

This descriptive analytical study was conducted on patients diagnosed with oral squamous cell carcinoma (OSCC) with no prior treatments or tumor recurrence. Demographic and clinical data, including age, sex, smoking status, alcohol consumption, and site of oral involvement, were recorded. Blood samples (20 mL) were collected and analyzed for serum levels of iron, copper, Vitamin B12, selenium, folate, and homocysteine, while cancer staging was performed by a surgeon.

Serum levels of biochemical factors across different clinical stages of OSCC were compared using SPSS software (Version 20). The Chi-square test evaluated the relationship between demographic factors and biochemical serum levels, with statistical significance set at $P < 0.05$. Archival data were used for TNM staging.

Results

Table 1: Demographic and Health History of OSCC Patients

Category	Value
Total Patients	25
Gender distribution	13 (52%) males , 12 (48%) females
Mean age	54.62 ± 12.32 years
Systemic Diseases	
Hypertension	5 (20%)
Diabetes	6 (24%)
Cardiovascular diseases	2 (8%)
Renal Insufficiency	1 (4%)
Cigarette smoking history	6 (24%)
Alcohol consumption history	8 (32%)

The study included 25 patients, with 52% male and 48% female participants. The mean age of the patients was 54.62 ± 12.32 years. Regarding systemic diseases, 20% had hypertension, 24% had diabetes, 8% had cardiovascular diseases, and 4% had renal insufficiency. Additionally, 24% had a history of cigarette smoking, while 32% had a history of alcohol consumption

Table 2: The mean±SD of serum levels of biochemical factors in oral squamous cell carcinoma patients

Metabolite	Mean ± SD (ng/dl)	Minimum (ng/dl)	Maximum (ng/dl)
Iron	72.1± 21.63	5.2	139.0
Copper	94.33± 23.58	52.32	136.34
Vitamin B12	70.46± 24.66	49.21	91.72
Selenium	265.38± 53.08	101.23	429.54
Folic acid	9.07± 3.63	1.9	16.24
Homocysteine	23.40 ± 7.02	8.7	38.11

SD: Standard deviation

The mean serum levels and standard deviations (SD) of various metabolites were as follows: Iron had a mean of 72.1 ± 21.63 ng/dl, Copper 94.33 ± 23.58 ng/dl, Vitamin B12 70.46 ± 24.66 ng/dl, Selenium 265.38 ± 53.08 ng/dl, Folic acid 9.07 ± 3.63 ng/dl, and Homocysteine 23.40 ± 7.02 ng/dl.

Discussion

Oral squamous cell carcinoma (OSCC) is one of the most prevalent malignancies of the oral cavity, characterized by high morbidity and mortality rates. Early diagnosis is crucial for improving survival outcomes, yet it remains challenging due to the absence of specific symptoms in the early stages. Recent studies have focused on identifying reliable biomarkers that can aid in the early detection and prognosis of OSCC. Biochemical factors in blood serum, such as altered levels of proteins, lipids, enzymes, and other metabolites, have shown promise as potential diagnostic and prognostic indicators. Understanding these biochemical alterations can provide valuable insights into the pathophysiology of OSCC and offer a non-invasive means of monitoring disease progression.[9,10]

In our study, 25 patients participated, with 52% male and 48% female individuals. The mean age of the participants was 54.62 ± 12.32 years. Regarding

systemic diseases, 20% had hypertension, 24% had diabetes, 8% had cardiovascular diseases, and 4% had renal insufficiency. Additionally, 24% had a history of cigarette smoking, while 32% had a history of alcohol consumption. The mean serum levels and standard deviations (SD) of various metabolites were as follows: Iron had a mean of 72.1 ± 21.63 ng/dl, Copper 94.33 ± 23.58 ng/dl, Vitamin B12 70.46 ± 24.66 ng/dl, Selenium 265.38 ± 53.08 ng/dl, Folic acid 9.07 ± 3.63 ng/dl, and Homocysteine 23.40 ± 7.02 ng/dl.

The study by Erugula SR et al.[11] aimed to measure and compare serum Homocysteine (Hcy) and serum folate levels in patients with Oral Squamous Cell Carcinoma (OSCC), smokers, and healthy controls, assessing the potential of serum Hcy as a tumor marker for OSCC. The study included 60 subjects: 30 OSCC patients (Group I), 15 smokers without OSCC (Group II), and 15 healthy controls (Group III). Serum Hcy levels were measured using High-Performance Liquid Chromatography (HPLC), and folate levels were determined by Chemiluminescence Immunoassay (CLIA). Results showed significant differences in both serum folate and Hcy levels across the groups ($p<0.001$), with OSCC patients having the lowest folate and the highest Hcy levels. The findings suggest that serum Hcy and folate levels may serve as valuable biochemical markers for the onset and progression of OSCC.

Palaskar S et al.[12] aimed to evaluate the potential of serum Homocysteine (Hcy) levels as a tumor marker for Oral Squamous Cell Carcinoma (OSCC). The study compared serum Hcy levels between OSCC patients and healthy individuals. The results indicated that serum Hcy levels were significantly higher in OSCC patients. The findings suggest that serum Hcy could serve as a useful biological marker for both the diagnosis and prognosis of OSCC.

A limitation of our study is the relatively small sample size, which may affect the generalizability and statistical power of the results. A larger sample size would provide more robust data and improve the accuracy of the conclusions drawn from the study.

Conclusion

The study provides insights into the serum levels of key metabolites in OSCC patients, suggesting their potential role in the disease's development and progression.

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