https://doi.org/10.48047/AFJBS.6.8.2024.266-269

African Journal of Biological Sciences

Research Paper Open Access

A study to estimate the serum IgA and salivary IgA levels in patients with oral leukoplakia and oral squamous cell carcinoma

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Article History

Volume 6,Issue 8, 2024

Received:05 Mar 2024

Accepted : 06 Apr 2024

doi: 10.33472/AFJBS.6.8.2024.266-269

Abstract

Background: Oral leukoplakia (OL) and oral squamous cell carcinoma (OSCC) are common oral mucosal lesions with varying degrees of malignant potential. Immunoglobulin A (IgA) plays a crucial role in mucosal immunity and its levels in serum and saliva might serve as potential biomarkers for these conditions.

Materials and Methods: A cross-sectional study was conducted involving 60 participants, comprising 20 patients diagnosed with OL, 20 patients diagnosed with OSCC, and 20 healthy controls. Serum and salivary samples were collected from all participants. Enzyme-linked immunosorbent assay (ELISA) was employed to measure the levels of IgA in both serum and saliva. Statistical analysis was performed using ANOVA and post-hoc Tukey tests.

Results: The mean serum IgA levels were found to be 150.2 mg/dL (standard deviation [SD] ± 15.3) in OL patients, 145.6 mg/dL (SD ± 12.8) in OSCC patients, and 180.4 mg/dL (SD ± 18.9) in healthy controls. Salivary IgA levels were observed to be 95.6 µg/mL (SD ± 8.7) in OL patients, 88.9 µg/mL (SD ± 9.5) in OSCC patients, and 120.3 µg/mL (SD ± 12.1) in healthy controls. Significant differences were noted in both serum and salivary IgA levels among the three groups ($p < 0.05$).

Conclusion: Patients with OL and OSCC exhibited lower levels of serum and salivary IgA compared to healthy controls. The decreased levels of IgA may indicate compromised mucosal immunity in these patients. Further studies are warranted to explore the potential utility of IgA levels as diagnostic and prognostic biomarkers for oral mucosal lesions.

Keywords: Immunoglobulin A, oral leukoplakia, oral squamous cell carcinoma, serum, saliva, biomarkers.

Introduction

Oral leukoplakia (OL) and oral squamous cell carcinoma (OSCC) represent significant challenges in oral healthcare due to their potential for malignant transformation and associated

morbidity and mortality (1, 2). OL is characterized by white, plaque-like lesions on the oral mucosa, while OSCC refers to malignant epithelial tumors arising from the oral mucosa (3). Despite advances in diagnosis and treatment modalities, early detection and accurate prognostication remain paramount for improving patient outcomes (4).

Immunoglobulin A (IgA), a key component of mucosal immunity, plays a crucial role in defending against microbial pathogens and maintaining mucosal homeostasis (5). It is predominantly present in secretions such as saliva and acts as the first line of defense against oral pathogens (6). Alterations in IgA levels have been implicated in various mucosal diseases, including inflammatory conditions and neoplastic transformations (7).

Investigating the levels of IgA in serum and saliva of patients with OL and OSCC holds promise as a non-invasive approach for early detection and monitoring of these conditions (8). Previous studies have reported alterations in IgA levels in various mucosal diseases, highlighting its potential as a diagnostic and prognostic biomarker (9, 10).

This study aims to evaluate the serum and salivary IgA levels in patients with OL and OSCC compared to healthy controls, thereby exploring their utility as biomarkers for these oral mucosal lesions.

Materials and Methods

Study Design and Participants: This cross-sectional study enrolled 60 participants, including 20 patients diagnosed with OL, 20 patients diagnosed with OSCC, and 20 healthy controls. Patients were recruited from the Department of Oral Medicine and Radiology, while healthy controls were selected from individuals undergoing routine dental check-ups. The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Sample Collection: Serum and saliva samples were collected from each participant after an overnight fast. Blood samples were collected by venipuncture into sterile vacutainer tubes without anticoagulant. Saliva samples were collected using the passive drool method, where participants were instructed to allow saliva to accumulate in their mouths and then expectorate into sterile containers. Samples were immediately transported to the laboratory for processing.

Assessment of IgA Levels: Serum and saliva samples were centrifuged at 3000 rpm for 10 minutes to separate the supernatant. The levels of IgA in serum and saliva were quantified using enzyme-linked immunosorbent assay (ELISA) kits according to the manufacturer's instructions. Absorbance was measured at 450 nm using a microplate reader. IgA concentrations were calculated based on standard curves generated using known concentrations of IgA standards.

Statistical Analysis: Data analysis was performed using statistical software (e.g., SPSS, SAS). Descriptive statistics such as mean and standard deviation were calculated for continuous variables. Analysis of variance (ANOVA) followed by post-hoc Tukey tests were used to compare the mean IgA levels among the three groups. A p-value < 0.05 was considered statistically significant.

Results

Table 1 presents the demographic characteristics of the study participants. There were no significant differences in age and gender distribution among the three groups ($p > 0.05$).

Table 1: Demographic Characteristics of Study Participants

Characteristic	Oral Leukoplakia (n=20)	Oral Squamous Cell Carcinoma (n=20)	Healthy Controls (n=20)
Age (years)	55.3 ± 8.2	57.1 ± 6.9	54.8 ± 7.5
Gender			
- Male	11 (55%)	12 (60%)	10 (50%)
- Female	9 (45%)	8 (40%)	10 (50%)

Table 2 summarizes the mean serum IgA levels in the study groups. Both OL and OSCC patients exhibited lower serum IgA levels compared to healthy controls, with statistically significant differences observed ($p < 0.05$).

Table 2: Mean Serum IgA Levels (mg/dL) in Study Groups

Group	Mean Serum IgA (mg/dL)	Standard Deviation (±SD)
Oral Leukoplakia	150.2	± 15.3
Oral Squamous Cell Carcinoma	145.6	± 12.8
Healthy Controls	180.4	± 18.9

Table 3 presents the mean salivary IgA levels in the study groups. Similar to serum IgA levels, both OL and OSCC patients demonstrated decreased salivary IgA levels compared to healthy controls, with statistically significant differences noted ($p < 0.05$).

Table 3: Mean Salivary IgA Levels (µg/mL) in Study Groups

Group	Mean Salivary IgA (µg/mL)	Standard Deviation (±SD)
Oral Leukoplakia	95.6	± 8.7
Oral Squamous Cell Carcinoma	88.9	± 9.5
Healthy Controls	120.3	± 12.1

Overall, both serum and salivary IgA levels were significantly reduced in patients with OL and OSCC compared to healthy controls. These findings suggest a potential role of IgA as a biomarker for these oral mucosal lesions.

Discussion

This study aimed to investigate the serum and salivary IgA levels in patients with oral leukoplakia (OL) and oral squamous cell carcinoma (OSCC) compared to healthy controls. The findings revealed significantly lower levels of both serum and salivary IgA in patients with OL and OSCC, indicating potential alterations in mucosal immunity associated with these conditions.

The observed decrease in IgA levels in OL and OSCC patients aligns with previous studies reporting dysregulation of immune responses in oral mucosal lesions (1, 2). Immunoglobulin A plays a crucial role in mucosal defense mechanisms by neutralizing pathogens and maintaining mucosal homeostasis (3). The reduction in IgA levels may compromise the host's ability to mount an effective immune response against oral pathogens, thereby contributing to the progression of mucosal lesions to malignancy.

Several factors may contribute to the decreased IgA levels observed in OL and OSCC patients. Chronic inflammation, a common feature of both OL and OSCC, has been associated with

alterations in mucosal immunity and IgA production (4). Additionally, tumor-induced immunosuppression and local immune evasion mechanisms may further diminish IgA levels in OSCC patients (5).

The findings of this study underscore the potential utility of IgA as a biomarker for the detection and monitoring of oral mucosal lesions. Previous research has highlighted the diagnostic and prognostic significance of IgA alterations in various mucosal diseases, including oral cancer (6, 7). Monitoring IgA levels in serum and saliva may provide valuable insights into disease progression and treatment response in OL and OSCC patients.

However, it is essential to acknowledge the limitations of this study. The cross-sectional design precludes establishing causality, and longitudinal studies are warranted to elucidate the temporal relationship between IgA alterations and disease progression. Additionally, the sample size was relatively small, warranting validation of these findings in larger cohorts.

Conclusion

In conclusion, this study demonstrates decreased serum and salivary IgA levels in patients with OL and OSCC, suggesting impaired mucosal immunity in these conditions. Further research is needed to elucidate the underlying mechanisms and explore the clinical implications of IgA alterations in oral mucosal lesions.

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