

Histopathological Aspects in Oral Squamous Cell Carcinoma: A Retrospective Study

Puja Kumari¹, Mala Kumari², Md. Ghulam Tabraiz³

¹Tutor, Department of Pathology, JNKTMCH, Madhepura, Bihar, India

²Tutor, Department of Pathology, JNKTMCH, Madhepura, Bihar, India

³Professor, Department of Pathology, JNKTMCH, Madhepura, Bihar, India

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Corresponding Author: Mala Kumari

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Abstract:

Background: Oral squamous cell carcinoma (OSCC) is the most common malignancy of the oral cavity and represents a significant public health burden in developing countries. Histopathological evaluation plays a critical role in diagnosis, grading, and prognosis of OSCC.

Objective: To evaluate histopathological characteristics of oral squamous cell carcinoma cases diagnosed at a tertiary care center.

Methods: This retrospective study included 50 histopathologically confirmed OSCC cases diagnosed at JNKT Medical College and Hospital, Madhepura over a period of one year. Parameters analyzed included age, gender, tumor site, histological grade, keratinization pattern, lymphovascular invasion, and perineural invasion.

Results: The majority of patients were males (68%). The most common site was buccal mucosa (36%). Well differentiated carcinoma constituted 44% of cases. Keratin pearl formation was observed in 62% cases. Lymphovascular invasion was present in 22% cases while perineural invasion occurred in 18% cases.

Conclusion: Histopathological evaluation remains essential for assessing tumor differentiation and aggressiveness in oral squamous cell carcinoma. Most tumors in the present study were moderately to well differentiated with frequent keratinization.

Keywords: Oral Squamous Cell Carcinoma, Histopathology, Keratin Pearls, Tumor Grade, Retrospective Study.

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Introduction

Oral squamous cell carcinoma accounts for nearly 90% of malignant tumors of the oral cavity and remains a major health concern worldwide [1]. The burden of oral cancer is particularly high in developing countries due to widespread tobacco and betel nut consumption [2].

Histopathological examination remains the gold standard for diagnosis of oral malignancies and provides essential information regarding tumor differentiation and prognosis [3]. Tumor grade is an important determinant of biological behavior and treatment outcome [4].

Squamous cell carcinoma arises from dysplastic epithelium and progresses through stages of increasing cellular atypia and invasion [5]. Histological features such as keratinization, nuclear pleomorphism and mitotic activity reflect tumor aggressiveness [6].

The most commonly affected anatomical sites include buccal mucosa, tongue, alveolus and floor of

mouth [7]. Geographic variation exists in site distribution depending on tobacco habits [8].

Histological grading divides tumors into well differentiated, moderately differentiated and poorly differentiated types [9]. Well differentiated tumors typically show keratin pearl formation whereas poorly differentiated tumors show minimal keratinization [10].

Keratin pearl formation is considered a characteristic feature of squamous differentiation and correlates with better prognosis [11]. In contrast, poorly differentiated tumors tend to show aggressive behavior [12].

Lymphovascular invasion and perineural invasion are important histopathological indicators of tumor spread and recurrence [13].

Despite improvements in diagnostic methods, histopathology continues to be the cornerstone for evaluating tumor characteristics [14].

Therefore, the present study was conducted to evaluate histopathological features of oral squamous cell carcinoma in patients attending a tertiary care hospital.

Materials and Methods

Study Design and Setting: This retrospective descriptive study was conducted in the Department of Pathology, JNKT Medical College and Hospital, Madhepura over a period of one year.

Institutional ethical clearance was obtained prior to the study. Only anonymized patient data were used.

Study Population: The study included 50 histopathologically confirmed cases of oral squamous cell carcinoma diagnosed during the study period.

Cases were identified from:

- Histopathology registers
- Biopsy reports
- Medical record files

Inclusion Criteria

- Histopathologically confirmed OSCC
- Adequate biopsy specimen
- Complete histopathology reports
- Age >18 years

Exclusion Criteria

- Recurrent tumors
- Inadequate biopsy samples
- Non-squamous malignancies
- Incomplete records

Histopathological Processing

Biopsy specimens were:

1. Fixed in 10% formalin
2. Processed by paraffin embedding
3. Sectioned at 4–5 μ m
4. Stained with Hematoxylin and Eosin stain

Microscopic examination was performed using light microscopy.

Histopathological Parameters Studied

Demographic Variables

- Age

- Gender

Tumor Characteristics

- Tumor site
- Histological grade
- Keratinization
- Keratin pearl formation
- Lymphovascular invasion
- Perineural invasion

Histological Grading

Tumors were graded according to **WHO criteria:**

- Well differentiated
- Moderately differentiated
- Poorly differentiated

Outcome Measures

Primary outcome:

- Distribution of histopathological grades

Secondary outcomes:

- Keratinization pattern
- Invasion characteristics

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables such as age were expressed as mean \pm standard deviation, while categorical variables including tumor site and histological grade were expressed as frequency and percentage. The Chi-square test was applied to assess association between tumor grade and histopathological features including keratinization, lymphovascular invasion and perineural invasion. A p-value less than 0.05 was considered statistically significant.

Results

Study Population: A total of 50 histopathologically confirmed cases of oral squamous cell carcinoma were included in the present retrospective study. The demographic characteristics of the study population are summarized in Table 1.

The mean age of patients was 52.8 ± 11.6 years, with the majority of patients belonging to the 41–60 year age group. Males constituted 34 cases (68%), while females accounted for 16 cases (32%), showing a clear male predominance.

Table 1 Demographic Characteristics of Study Population

Variable	Number (n=50)	Percentage
Male	34	68%
Female	16	32%
Mean Age (years)	52.8 ± 11.6	—

Table 1 demonstrates a predominance of male patients with oral squamous cell carcinoma.

Age Distribution: Most patients were observed in the middle-aged group. The distribution of patients according to age is shown in Table 2.

Table 2 Age Distribution

Age Group (Years)	Number	Percentage
21-40	10	20%
41-60	26	52%
>60	14	28%

Table 2 shows that 41-60 years was the most commonly affected age group.

The buccal mucosa was the most commonly involved site, accounting for 18 cases (36%), followed by tongue in 14 cases (28%). Other sites included gingiva, floor of mouth, and palate.

Tumor Site Distribution

The anatomical distribution of tumors is presented in Table 3.

Table 3 Tumor Site Distribution

Site	Number	Percentage
Buccal mucosa	18	36%
Tongue	14	28%
Gingiva	8	16%
Floor of mouth	6	12%
Palate	4	8%

Figure 1 demonstrates that buccal mucosa was the predominant tumor site.

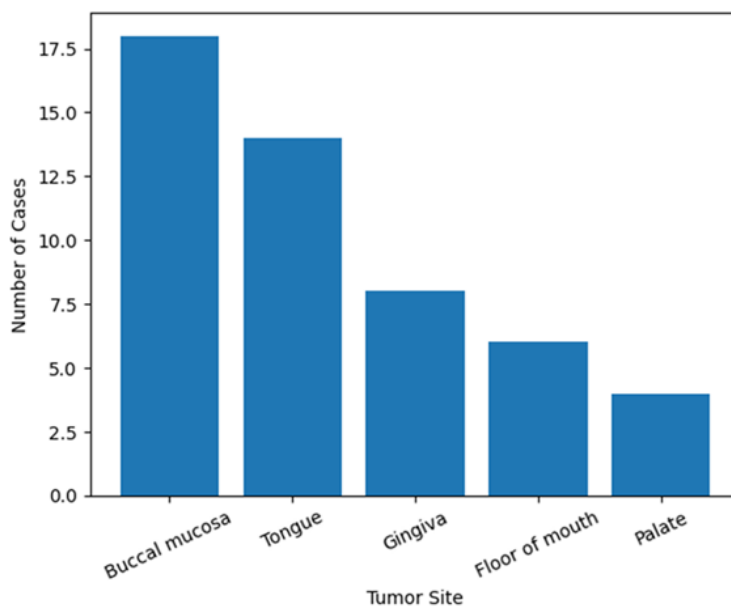


Figure 1 Tumor Site Distribution

Histopathological Grading

Histological grading of tumors is shown in Table 4.

Well differentiated carcinoma was observed in 22 patients (44%), moderately differentiated carcinoma in 20 patients (40%), and poorly differentiated carcinoma in 8 patients (16%).

Table 4 Histological Grade Distribution

Grade	Number	Percentage
Well differentiated	22	44%
Moderately differentiated	20	40%
Poorly differentiated	8	16%

Figure 2 demonstrates predominance of well differentiated tumors.

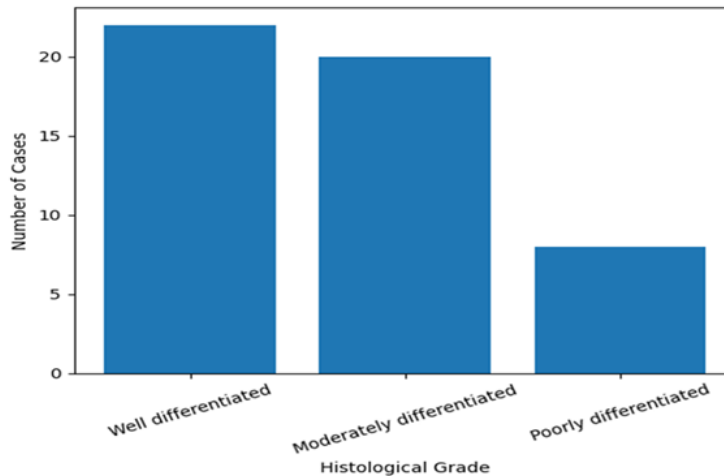


Figure 2. Histological Grade Distribution

Keratinization Pattern

Keratin pearl formation was observed in 31 cases (62%), while 19 cases (38%) did not show

keratinization. These findings are summarized in Table 5.

Table 5 Keratinization Pattern

Finding	Number	Percentage
Keratin pearls present	31	62%
Keratin pearls absent	19	38%

Table 5 shows that keratinization was present in the majority of cases.

Lymphovascular invasion was identified in 11 cases (22%), while perineural invasion was observed in 9 cases (18%). These findings are presented in Table 6.

Tumor Invasion Characteristics

Table 6 Tumor Invasion Characteristics

Parameter	Present	Absent	Percentage Present
Lymphovascular invasion	11	39	22%
Perineural invasion	9	41	18%

Table 6 demonstrates the presence of invasion characteristics in a considerable proportion of tumors.

Keratin pearls were present in:

- 20 of 22 well differentiated tumors
- 9 of 20 moderately differentiated tumors
- 2 of 8 poorly differentiated tumors

Association Between Tumor Grade and Keratinization

A statistically significant association was observed between tumor differentiation and keratin pearl formation. The relationship between tumor grade and keratinization is shown in Table 7.

The association was statistically significant ($\chi^2 = 14.2, p = 0.001$).

Table 7 Association Between Histological Grade and Keratinization

Grade	Keratin Present	Keratin Absent
Well differentiated	20	2
Moderately differentiated	9	11
Poorly differentiated	2	6

Table 7 demonstrates a significant association between tumor differentiation and keratinization.

Summary of Key Findings: The present study demonstrated that oral squamous cell carcinoma occurred predominantly in middle-aged males, with buccal mucosa being the most frequently involved

site. Well differentiated carcinoma was the most common histological type. Keratin pearl formation was observed in the majority of tumors and showed a statistically significant association with tumor differentiation. Lymphovascular and perineural invasion were identified in a notable proportion of cases, indicating variable tumor aggressiveness.

Discussion

Oral squamous cell carcinoma represents the predominant malignancy affecting the oral cavity [15]. The disease burden remains high in India because of tobacco chewing and smoking habits [16].

Male predominance observed in this study is consistent with previous reports [17].

The mean age of 52.8 years corresponds with typical age distribution described in epidemiological studies [18].

Buccal mucosa was the most commonly affected site, which reflects regional chewing habits [19].

Well differentiated carcinoma constituted the largest proportion in this study. Similar findings have been reported previously [20].

Keratin pearl formation was present in 62% cases indicating squamous differentiation [21].

Lymphovascular invasion was observed in 22% cases and is considered an indicator of tumor spread [22].

Perineural invasion is an established prognostic factor and was observed in 18% cases [23].

Histological grading showed significant association with keratinization patterns in the present study [24].

The findings of the present study support the role of histopathology as an essential tool for diagnosis and prognostic evaluation in oral squamous cell carcinoma [25].

Conclusion

Histopathological examination provides essential information regarding tumor differentiation and aggressiveness in oral squamous cell carcinoma. The present study demonstrated that buccal mucosa was the most commonly involved site and well differentiated carcinoma was the predominant histological type. Keratin pearl formation was frequently observed and showed a significant association with tumor differentiation. Lymphovascular and perineural invasion were present in a considerable proportion of cases, indicating potential tumor aggressiveness. Careful histopathological evaluation is essential for appropriate diagnosis and prognostic assessment of oral squamous cell carcinoma.

Limitations

The present study has certain limitations. The retrospective design limited the availability of complete clinical and follow-up data. The sample size was relatively small and derived from a single tertiary care center, which may limit generalizability of the findings. Long-term survival and recurrence data were not available for analysis. Future prospective studies with larger sample sizes and extended follow-up periods are required to better understand the prognostic significance of histopathological parameters.

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