Scholars Journal of Dental Sciences
Abbreviated Key Title: Sch J Dent Sci
ISSN 2394-4951 (Print) | ISSN 2394-496X (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Demographic, Clinical and Pathological Factors Influencing Prognosis in Oral Cancer Patients

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DOI: https://doi.org/10.36347/sjds.2025.v12i05.001 | **Received:** 26.04.2025 | **Accepted:** 02.06.2025 | **Published:** 06.06.2025

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Abstract **Original Research Article**

Introduction: Oral squamous cell carcinoma (OSCC) represents the most prevalent malignancy of the head and neck region, with rising incidence and mortality globally. Understanding demographic, clinical, and pathological factors is critical for improving early diagnosis and guiding treatment strategies. In this study, we aimed to evaluate the demographic, clinical, and pathological characteristics of oral cancer patients and explore their potential influence on prognosis. ***Methods:*** This retrospective study was conducted in the Department of Oral and Maxillofacial Surgery, Shaheed Suhrawardy Medical College Hospital and Bangladesh ENT Hospital, Dhaka, Bangladesh, from July 2019 to June 2024. This study included 120 patients diagnosed with oral squamous cell carcinoma (OSCC) who received treatment and/or follow-up at these institutions. ***Result:*** The majority of patients were aged 51–60 years (43.33%), with a higher prevalence among females (60.83%). Advanced-stage disease (Stage III/IV) was observed in 60% of cases, and 61.67% reported tobacco or betel nut use. Pathologically, most tumors measured 2–4 cm (52.5%), and Grade I histology was predominant (53.33%). Perineural and lymphovascular invasion were present in 30.83% and 24.17% of cases, respectively. Surgical margins were negative in 89.17 % of patients. At 5-year follow-up, the recurrence rate was 12.5%, and the overall 5-year survival rate was 84.2%. Multivariate analysis identified histological grade II/III (AOR: 2.92; 95% CI: 1.01–8.47; p = 0.047), advanced clinical stage (AOR: 3.56; 95% CI: 1.20–10.55; p = 0.022), and close/positive resection margins (AOR: 4.18; 95% CI: 1.18–14.86; p = 0.027) as significant predictors of recurrence. ***Conclusion:*** The study findings show that histological grade, clinical stage, and surgical margin status are key prognostic indicators in oral cancer. Enhancing early detection strategies and integrating risk-based assessment into routine healthcare can improve overall prognosis and survival in oral cancer patients.

Keywords: Demographic, Clinical, Pathological Factors, Prognosis, Oral Cancer.

INTRODUCTION

Oral cancer is the most prevalent malignancy among head and neck carcinomas and has become a growing public health concern globally, particularly in developing countries, due to its high incidence, prevalence, and mortality [1]. It ranks as the sixth most common type of cancer worldwide, with oral squamous cell carcinoma (OSCC) being the most frequent histological subtype affecting oral tissues [2]. Advanced-stage diagnosis of OSCC significantly reduces patient survival [2]. Commonly affected sites include the lips, buccal mucosa, gingiva, hard and soft palate, tongue, floor of the mouth, salivary glands, tonsils, retromolar trigone, vallecula, and various oropharyngeal regions such as the posterior and lateral walls [3].

While factors such as age, tumor stage, anatomical site, and histological grade are known to influence survival, other variables, including the delay

between symptom onset and diagnosis, type and accessibility of treatment, and socio-demographic characteristics like education and occupation, also play a crucial role [4–8]. Identifying the factors associated with advanced-stage lesions is crucial for improving survival outcomes in affected individuals. Research suggests a higher prevalence of head and neck cancers among socioeconomically disadvantaged populations compared to individuals with greater access to healthcare services [9, 10]. Moreover, harmful habits such as tobacco use and alcohol consumption, which are established risk factors for oral cancer, tend to be more prevalent among lower-income groups [11, 12]. Lack of dental insurance and limited access to preventive dental care further contribute to delayed diagnosis, as early signs of oral cancer are often detectable during routine dental examinations [13].

The clinical-pathological profile of typical OSCC patients includes male sex, age between 50 and 60 years, and a history of tobacco use, with the tongue and floor of the mouth being the most frequently affected sites [3]. OSCC management may involve surgery, radiotherapy, chemotherapy, or a combination of these, with treatment outcomes dependent on the tumor site, stage at diagnosis, and lymphatic or distant metastatic spread [14]. Although the cervical lymph nodes are the primary site of metastasis, distant metastases (DM) are also a possibility and should not be overlooked, especially given the limited data available on metastatic patterns in OSCC [14-16].

While several studies have examined the influence of social determinants on oral cancer survival, many fail to adequately address potential confounding variables or are limited by small sample sizes [17]. Therefore, in this study, we aimed to evaluate the demographic, clinical, and pathological characteristics of oral cancer patients and explore their potential influence on prognosis.

METHODOLOGY & MATERIALS

This retrospective study was conducted in the Department of Oral and Maxillofacial Surgery, Shaheed Suhrawardy Medical College Hospital and Bangladesh ENT Hospital, Dhaka, Bangladesh, from July 2019 to June 2024. This study included 120 patients diagnosed with oral squamous cell carcinoma (OSCC) who received treatment and follow-up at these institutions with complete medical records. Patients with recurrent tumors and other carcinomas were excluded from the study.

Data Collection:

Demographic data like age, sex, residence (urban/rural), education level, and occupational status were extracted from hospital records and pathology reports. Clinical data like primary tumor site, clinical stage at diagnosis (based on TNM classification), and presence of risk factors such as tobacco or alcohol use were collected. Pathological parameters included tumor size, histological grade, nodal involvement, lymphovascular invasion, perineural invasion, and surgical margin status. Follow-up data were collected to determine the duration of follow-up.

Statistical Analysis:

All data were recorded systematically in a pre-formatted data collection form. Quantitative data were expressed as mean and standard deviation; qualitative data were expressed as frequency distribution and percentage. The data were analyzed using SPSS 22 (Statistical Package for Social Sciences) for Windows version 10. The study was approved by the Institutional Ethics Committee of Shaheed Suhrawardy Medical College.

RESULTS

Table 1: Demographic characteristics of study patients

Demographic characteristics	N=120	P (%)
Age		
21-30 years	9	7.50
31-40 years	14	11.67
41-50 years	21	17.50
51-60 years	52	43.33
>60 years	24	20.00
Mean age (years)	52.0 ± 11.9	
Gender		
Male	47	39.17
Female	73	60.83
Residence		
Urban	65	54.17
Rural	55	45.83
Education level		
No formal education	38	31.67

Demographic characteristics	N=120	P (%)
Primary	48	40.00
Secondary or higher	34	28.33
Annual income (Tk)		
< 100,000	38	31.67
100,000 – 200,000	66	55.00
200,001 – 250,000	11	9.17
> 250,000	5	4.17
Tobacco/Betel Nut Use		
Yes	74	61.67
No	46	38.33

Table 1 presents the demographic characteristics of the 120 patients included in the study. The majority of patients were in the 51–60 years age group (43.33%), with a mean age of 52.0 ± 11.9 years. Females comprised a higher proportion of the study participants (60.83%) compared to males (39.17%). Over half of the patients (54.17%) resided in urban areas, while 45.83% were from rural settings. In terms of education level, 40% had primary education, 31.67% had no formal education, and 28.33% had received secondary or higher education. The majority of patients (55%) reported an annual income between Tk 100,000 and Tk 200,000, followed by 31.67% who had an annual income of less than Tk 100,000, indicating a lower socioeconomic status. A significant number (61.67%) of patients reported tobacco or betel nut use.

Table 2: Clinical Characteristics and Risk Factors of Oral Cancer Patients

Clinical variables	N=120	P (%)
Primary Tumor Site		
Tongue	23	19.17
Buccal Mucosa	31	25.83
Alveolar Ridge/RMT	14	11.67
Other	52	43.33
Clinical Stage at Diagnosis		
Early (TNM Stage I/II)	48	40.0
Advanced (TNM Stage III/IV)	72	60.0
Lymph Node Metastasis (LNM)		
Absent	91	75.83
Present	29	24.17
Risk factors		
Tobacco Use	56	46.67
Betel Nut Use	36	30.00
Poor oral hygiene	22	18.33
Vitamin deficiencies	16	13.33

Table 2 summarizes the clinical characteristics of the patients. The buccal mucosa was the most frequently affected primary site (25.83%), followed by the tongue (19.17%). Most patients (60%) presented with advanced-stage disease (TNM Stage III/IV). Regional lymph node metastasis was detected in 24.17% of cases. Tobacco use was the most commonly reported risk factor (46.67%), followed by betel nut use (30%), poor oral hygiene (18.33%), and vitamin deficiencies (13.33%).

Table 3: Pathological Characteristics of Oral Cancer Patients

Pathological Characteristics	N=120	P (%)
Size of the lesion		
0-2 cm	27	22.50
2-4 cm	63	52.50
>4cm	30	25.00
Histological Grade		
Grade I	64	53.33
Grade II	48	40.00
Grade III	8	6.67
Perineural Invasion		
Absent	83	69.17

Pathological Characteristics	N=120	P (%)
Present	37	30.83
Lymphovascular Invasion		
Absent	111	75.83
Present	9	24.17
Distant Metastases (DM)		
Yes	6	5.0
No	114	95.0
Resection Margin		
Negative (>5 mm)	107	89.17
Close/Positive (≤5 mm)	13	10.83
Treatment modalities		
Surgery alone	47	39.17
Surgery + Radiotherapy	42	35.00
Surgery + Chemotherapy	31	25.83

Table 3 outlines the pathological findings. The majority of tumors measured between 2–4 cm in size (52.5%). Regarding tumor differentiation, Grade I tumors were the most common (53.33%), followed by Grade II (40%) and Grade III (6.67%). Perineural invasion was present in 30.83% of patients, and lymphovascular invasion (LVI) was identified in 24.17%. In terms of surgical pathology, most patients (89.17%) had negative resection margins (>5 mm), while a small subset (10.83%) had close or positive margins (≤5 mm). Among participants, surgery alone was performed in 39.17% of cases, followed by surgery plus radiotherapy (35%), and surgery plus chemotherapy (25.83%).

Table 4: Prognostic Outcomes at 5-Year Follow-Up

Outcome	N=120	P (%)
Recurrence	15	12.50
Regional LNM (Post-op)	24	20.00
5-Year Survival	101	84.17

Table 4 shows that at the 5-year follow-up, 15 patients (12.5%) experienced disease recurrence, while regional lymph node metastasis was observed postoperatively in 24 patients (20.0%). The overall 5-year survival rate among the study population was 84.2%, with 101 out of 120 patients surviving beyond five years following treatment.

Table 5: Multivariate Logistic Regression Analysis of Factors Associated with Tumor Recurrence

Variables	Adjusted Odds Ratio (AOR)	95% CI	p-value
Age > 50 years	1.85	0.62–5.54	0.267
Male gender	1.42	0.53–3.81	0.482
Histological Grade (II/III)	2.92	1.01–8.47	0.047
Advanced Stage (III/IV)	3.56	1.20–10.55	0.022
Close/Positive Margin	4.18	1.18–14.86	0.027

In Table 5, the multivariate logistic regression analysis reveals the association between various clinical and pathological factors and the likelihood of tumor recurrence among oral cancer patients. After adjusting for potential confounders, patients with histological grade II or III tumors had nearly three times higher odds of recurrence compared to those with grade I tumors (AOR: 2.92; 95% CI: 1.01–8.47; p = 0.047). Similarly, advanced-stage disease (Stage III/IV) (AOR: 3.56; 95% CI: 1.20–10.55; p = 0.022) and close or positive resection margins (AOR: 4.18; 95% CI: 11.18–14.86; p = 0.027) were significantly associated with an increased recurrence risk. Age over 50 years and male gender were not statistically significant predictors of recurrence.

DISCUSSION

Oral cancer ranks as the tenth leading cause of death worldwide. In this study, demographic factors, such as age, are associated with a higher likelihood of presenting with advanced-stage oral cancer, consistent with findings from previous research [18-20].

The majority of patients in this cohort were aged between 51 and 60 years, aligning with previous literature that reports peak incidence in the fifth and sixth decades of life [21, 22]. The mean age of 52.0 ± 11.9 years. Similarly, Wong *et al*. found the average age of onset was 51.7 years [23]. The observed female predominance (60.83%) contrasts with traditional global trends where males are typically more affected [24].

Socioeconomic status appeared to be a significant underlying factor in this cohort, with over 30% of patients earning less than Tk 100,000 annually. Low income has been associated with delayed diagnosis, reduced access to specialized care, and poorer outcomes in oral cancer patients [25]. According to the educational level, the present study found that the highest prevalence of oral cancer in advanced stages was in the group with primary or no formal education. This finding is similar to other literature results, which indicate that socioeconomically disadvantaged groups are associated with higher rates of unemployment, low income, and

limited access to education [26]. The majority of participants had no or only primary-level education, a factor linked to limited awareness of oral cancer risk factors and preventive behaviors [27].

Clinically, the buccal mucosa (25.83%) was the most commonly affected site. A relatively high percentage of patients (60%) were diagnosed at advanced stages (TNM III/IV). Buccal mucosa was the most common site for oral cancer, followed by the anterior tongue, and this was also comparable with other studies in Taiwan [28,29].

Research shows that alcohol and tobacco consumption significantly impact the prevalence of advanced-stage oral cancer lesions [11]. Risk factors such as tobacco and betel nut use were prevalent, reported by 46.67% and 30% of patients, respectively. These habits are well-documented etiological contributors to oral squamous cell carcinoma [30, 31]. Poor oral hygiene and nutritional deficiencies also emerged as notable factors. However, the level of schooling should be considered alongside other factors related to the incidence of cancer, such as excessive consumption of alcohol, tobacco, sedentary lifestyle, and irregular diet [32].

Pathological analysis revealed that most tumors were between 2–4 cm, and well-differentiated (Grade I) histological types were predominant. Well-differentiated tumors generally have better prognostic outcomes compared to poorly differentiated forms [33]. Lymph node involvement was absent in over three-fourths of the cases [34]. The presence of perineural and lymph vascular invasion, although not observed in the majority of patients, has been shown to significantly increase the risk of recurrence and reduce disease-free survival [35].

Metastasis is strongly correlated with poor prognosis and reduced survival. [36] In this study, distant metastases were observed in only 5% of cases, a relatively low incidence; however, their presence remains clinically significant due to their association with advanced disease and poor outcomes. Most patients had negative resection margins, an encouraging indicator of complete tumor removal and lower recurrence risk [37]. Regarding treatment modalities, surgery remained the mainstay of management, either alone or in combination with radiotherapy or chemotherapy. The use of multimodal therapy was observed in a considerable proportion of patients, reflecting adherence to evidence-based treatment protocols for advanced disease [38].

In the present study, multivariate analysis identified histological grade II/III (AOR: 2.92; 95% CI: 1.01–8.47; p = 0.047), advanced clinical stage (AOR: 3.56; 95% CI: 1.20–10.55; p = 0.022), and close/positive resection margins (AOR: 4.18; 95% CI: 1.18–14.86; p = 0.027) as significant predictors of recurrence. Vázquez-Mahía et al. found that, in a multivariate Cox regression analysis, patients with poorly differentiated tumors had a more than fivefold increased risk of recurrence compared to those with well-differentiated tumors (RR: 5.63; 95% CI: 1.39–22.8; p = 0.02), presence of coexisting disorders (RR: 2.44; 95% CI: 1.13–5.24; p = 0.02), and advanced disease stage (Stage IV) was independently associated with a twofold increase in recurrence risk (RR: 2.08; 95% CI: 1.04–4.13; p = 0.04) [39].

Limitations of the Study

The study was a double-center study. We took a modest sample size, which may limit the generalizability of the findings to broader populations. The follow-up period, although sufficient to assess 5-year survival and recurrence, may not capture long-term survivorship issues or late recurrences.

CONCLUSION AND RECOMMENDATIONS

This study highlights the significant influence of demographic, clinical, and pathological factors on the prognosis of oral cancer patients. A substantial proportion of patients presented with advanced-stage disease and high-grade tumor differentiation. The majority were female, middle-aged, and from lower socioeconomic backgrounds, with tobacco and betel nut use being common risk factors. Multivariate analysis revealed that higher histological grade, advanced tumor stage, and close or positive surgical margins were independently associated with an increased risk of recurrence. These findings underscore the prognostic importance of comprehensive pathological evaluation and the necessity of long-term follow-up in high-risk cases. Despite a favorable overall 5-year survival rate of 84.2%, identifying patients at greater risk of recurrence remains essential to improving long-term outcomes.

Further study with a prospective and longitudinal study design, including a larger sample size, needs to be done to validate the findings of this study.

Funding: No funding sources

Conflict of Interest: None declared

Ethical Approval: This study was approved by the ethical review committee

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