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

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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 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 our institution. ***Result:*** The mean age of patients was 52.01 ± 13.21 years, with a predominance of females (60%) and urban residents (54.17%). The most commonly affected site was the buccal mucosa (40.83%), and 65% were diagnosed at an early clinical stage. Tobacco use was the most prevalent risk factor (46.67%). Pathologically, 56.67% of tumors were 2–4 cm in size, and 60.83% were well-differentiated. Lymph node involvement was seen in 77.5% of cases. High rates of perineural invasion (86.67%) and lymph vascular invasion (84.17%) were observed. Distant metastases were present in 48.33% of patients. Most patients underwent surgery alone (50.83%), with others receiving additional radiotherapy or chemotherapy. ***Conclusion:*** The findings suggest that socioeconomic factors may be related to the advancement of the clinical stage of 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 therefore essential to 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 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 our institution.

These are the following criteria to be eligible for enrollment as our study participants: a) Patients aged over 18 years; b) Patients with histopathologically confirmed OSCC; c) Patients with complete medical records including demographic, clinical, and pathological data; d) Patients who were willing to participate were included in the study And a) Patients with any other carcinoma; b) Patients with recurrent tumors; c) Patients who were lost to follow-up within three months of diagnosis were excluded from our 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 and the presence or absence of distant metastases (DM).

Statistical Analysis:

All data were recorded systematically in a preformed 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 our study patients

Demographic characteristics	N=120	P (%)
Age		
21-30 years	9	7.50
31-40 years	21	17.50
41-50 years	28	23.33
51-60 years	42	35.00
>60 years	20	16.67
Mean age (years)	52.01±13.21	
Gender		
Male	48	40.00
Female	72	60.00
Residence		
Urban	65	54.17
Rural	55	45.83

Demographic characteristics	N=120	P (%)
Education level		
No formal education	38	31.67
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

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 (35%), with a mean age of 52.01 ± 13.21 years. Females comprised a higher proportion of the study participants (60%) compared to males (40%). Over half of the patients resided in urban areas (54.17%), 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.

Table 2: Clinical Characteristics of Oral Cancer Patients

Clinical variables	N=120	P (%)
Primary Tumor Site		
Tongue	26	21.67
Buccal mucosa	49	40.83
Floor of mouth	28	23.33
Other	17	14.17
Clinical Stage at Diagnosis		
Early (TNM Stage I/II)	78	65.00
Advanced (TNM Stage III/IV)	42	35.00
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 (40.83%), followed by the floor of the mouth (23.33%) and tongue (21.67%). A majority (65%) were diagnosed at an early clinical stage (TNM Stage I/II). 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 (%)
Site of the lesion		
0-2 cm	30	25.00
2-4 cm	68	56.67
>4cm	22	18.33
Histological Grade		
Well-differentiated (Grade I)	73	60.83
Moderately differentiated (Grade II)	39	32.50
Poorly differentiated (GRADE III)	8	6.67
Lymph Node Involvement		
Absent	27	22.50
Palpable ipsilateral node <3 cm	64	53.33
Palpable ipsilateral node3-6 cm	19	15.83
Two or more palpable ipsilateral nodes 3-6 cm	7	5.83
Bilateral or contralateral palpable node>6 cm	3	2.50

Pathological Characteristics	N=120	P (%)
Perineural Invasion		
Absent	104	86.67
Present	16	13.33
Lymph vascular Invasion		
Absent	101	84.17
Present	19	15.83
Distant Metastases (DM)		
Yes	58	48.33
No	62	51.67
Resection Margin		
Negative	104	86.67
Positive	16	13.33
Treatment modalities		
Surgery alone	61	50.83
Surgery + Radiotherapy	26	21.67
Surgery + Chemotherapy	12	10.00
Surgery+ Chemoradiotherapy	21	17.50

Table 3 outlines the pathological findings. Most tumors were between 2–4 cm in size (56.67%), and 60.83% of cases were well-differentiated histologically. Lymph node involvement was present in 77.5% of patients, with 53.33% having a palpable ipsilateral node <3 cm. Perineural invasion and lymph vascular invasion were absent in 86.67% and 84.17% of cases, respectively. Distant metastases were present in 48.33% of patients. Resection margins were negative in most cases (86.67%). Regarding treatment, half of the patients (50.83%) underwent surgery alone, while others received combinations of surgery with radiotherapy (21.67%), chemotherapy (10%), or both (17.50%).

DISCUSSION

Oral cancer ranks as the tenth leading cause of death worldwide. This study highlights that certain socio-demographic factors, such as education level and age, which have also been noted in previous research, are linked to a higher prevalence of advanced-stage oral cancer [18-20].

The majority of patients in our 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 52.01 ± 13.21 years. Similarly, Wong *et al*., found the average age of onset was 51.7 years old [23]. The observed female predominance (60%) contrasts with traditional global trends where males are typically more affected [24].

Socioeconomic status appeared to be a significant underlying factor in our 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, our study found 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 little 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 was the most commonly affected site. A relatively high percentage of patients (65%) were diagnosed at early stages (TNM I/II), which may be attributed to increased awareness and better access to diagnostic services. Nonetheless, 35% presented at advanced stages, reinforcing the persistent need for targeted community screening and education. 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 histological types were predominant. Well-differentiated tumors generally have better prognostic outcomes compared to poorly differentiated forms [33]. Lymph

node involvement was present in over three-fourths of the cases, a key determinant of survival [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].

Distant metastases were noted in 48.33% of cases, a concerning figure as metastasis is strongly correlated with poor prognosis and reduced survival [36]. 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].

Limitations of the Study

Our study was a single-center study. We took a small sample size due to the short study period. After evaluating those patients, we did not follow up with them for the long term and did not know other possible interference that may happen in the long term with these patients.

CONCLUSION AND RECOMMENDATIONS

In our study, we found that a substantial number of patients presented with identifiable risk factors such as tobacco and betel nut use, yet nearly half were diagnosed at an advanced stage, highlighting gaps in early detection and public awareness. The predominance of perineural and lymph vascular invasion, along with notable rates of nodal involvement and distant metastases, further emphasizes the aggressive nature of the disease in a significant subset of patients. Our findings suggest that socioeconomic factors may be related to the advancement of the clinical stage of oral cancer. Enhancing early detection strategies and integrating risk-based assessment into routine healthcare can improve overall prognosis and survival in oral cancer patients.

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

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