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Original Article

Clinicopathological Features of Buccal Carcinoma: A Cross-Sectional Study

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ABSTRACT

Background: Buccal carcinoma remains a leading oral cavity malignancy in Bangladesh, frequently presenting with advanced-stage disease and substantial functional impairment. Its clinicopathological profile, including tumor grade, perineural invasion, and nodal status, critically guides therapeutic decisions. However, contemporary regional data are limited. **Objective:** To evaluate the clinicopathological features and nodal metastasis patterns in patients with buccal carcinoma. **Methods & Materials:** This prospective cohort study enrolled 52 patients with histologically confirmed buccal squamous cell carcinoma at Community Based Medical College Hospital Bangladesh, Mymensingh, from January 2024 to December 2025, using purposive sampling. Clinical tumor-node-metastasis staging, histologic grade, perineural and lymphovascular invasion, and cervical nodal involvement were systematically recorded. Data were analyzed using SPSS version 23.0, with descriptive statistics and chi-square tests applied. **Results:** Among 52 patients, the mean age was 54.3±11.2 years, with male predominance (65.4%, n=34). Advanced T3/T4 tumors comprised 59.6% (n=31), and 42.3% (n=22) had cervical nodal metastasis. Moderately differentiated squamous cell carcinoma was most frequent (53.8%, n=28). Perineural invasion occurred in 30.8% (n=16) and lymphovascular invasion in 23.1% (n=12). Nodal metastasis significantly correlated with advanced T-stage and perineural invasion ($p<0.05$). **Conclusion:** Buccal carcinoma in our cohort exhibits aggressive local features and a notable nodal metastasis rate, especially in advanced stages. Perineural invasion emerges as a key predictor, underscoring the need for vigilant clinical assessment and multimodal management.

Keywords: Buccal carcinoma, Neoplasm staging, Perineural invasion, Squamous cell carcinoma, Tumor grade.

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INTRODUCTION

Buccal carcinoma, a squamous cell malignancy arising from the inner mucosal lining of the cheek, constitutes a major component of the global oral cancer burden, particularly in South and Southeast Asia [1]. In Bangladesh, oral cavity cancers rank among the top three malignancies, with the buccal mucosa being one of the most frequently affected subsites [2]. Regional hospital-based series indicate that buccal mucosa accounts for nearly 30-40% of all oral squamous cell carcinomas in this part of the world [3]. The age-standardized incidence rate of lip and oral cavity cancer in Bangladesh was estimated at 8.9 per 100,000 population in 2020, reflecting a persistently high endemicity that demands continued epidemiological surveillance [4]. The disproportionately high prevalence in this region is inextricably linked to deeply ingrained cultural practices, including habitual betel quid chewing, areca nut consumption, and various forms of smokeless and smoked tobacco use [5]. These carcinogenic exposures are often initiated in adolescence and continued for decades, resulting in cumulative genomic damage in the buccal epithelium [6]. This damage drives malignant transformation through well-characterized pathways involving chronic inflammation, oxidative stress, and activation of oncogenic signaling cascades [7]. Unlike Western populations, where oral tongue and floor-of-mouth cancers predominate, buccal carcinoma remains the dominant subsite in Bangladesh and neighboring South Asian countries [8]. This distinct anatomical predilection underscores the necessity for region-specific characterization rather than relying upon extrapolation from Western cohort data [4]. Histologically, more than 90% of buccal malignancies are squamous cell carcinoma, exhibiting varying degrees of differentiation from well to poorly differentiated types [9]. Clinically, patients typically present with persistent mucosal ulceration, induration, a proliferative exophytic mass, or referred otalgia [2]. However, a substantial proportion of patients delay seeking medical care until the tumor has reached an advanced T-stage (T3/T4) or has already developed clinically evident cervical lymph node metastasis [9]. This delay is multifactorial, encompassing low health literacy, financial constraints, and limited access to primary healthcare facilities in rural Bangladesh, where the majority of the population resides [5]. Consequently, many individuals present with stage III or IV disease, a circumstance that markedly compromises both long-term survival and post-treatment functional outcomes [10]. The clinicopathological profile of buccal carcinoma encompasses several critical parameters that directly influence treatment stratification and prognostic estimation [10]. Primary tumor extent (T-stage), histological grade, depth of invasion, perineural invasion, lymphovascular invasion, and cervical nodal status are universally recognized as core determinants of disease behavior and recurrence risk [11]. Among these, perineural invasion has emerged as a particularly ominous feature, consistently associated with increased locoregional recurrence and reduced disease-free survival irrespective of adjuvant therapy [12]. Likewise, lymphovascular invasion and the presence of extranodal extension further refine postoperative risk assessment and guide clinical decisions regarding the addition of concurrent chemoradiotherapy [13]. Despite these well-established correlates, the distribution and interrelationship of these pathological features in the Bangladeshi buccal carcinoma population remain inadequately documented in the contemporary literature [8]. Most published data currently derive from Indian or Pakistani cohorts, which may not fully reflect the local epidemiological, nutritional, or

histopathological nuances present in Bangladesh [12]. Furthermore, while several retrospective audits have been conducted at tertiary centers in Dhaka and Chittagong, prospective, protocol-driven data capturing comprehensive clinicopathological variables with validated staging systems remain scarce [1]. This evidence gap hampers the development of evidence-based, locally adapted clinical algorithms and impedes meaningful direct comparisons with regional and global benchmark outcomes [13]. Given the substantial caseload and the persistently high proportion of advanced-stage disease observed in our institutional practice, a systematic prospective evaluation of the full clinicopathological spectrum of buccal carcinoma is urgently warranted. Therefore, this prospective cohort study was designed to delineate the clinicopathological features, including tumor grade, perineural and lymphovascular invasion, and cervical nodal metastasis patterns, in a consecutive series of patients with histologically confirmed buccal squamous cell carcinoma presenting to a tertiary care hospital in Mymensingh, Bangladesh. The findings are expected to provide contemporary, locally relevant baseline data to inform clinical decision-making, risk stratification, and future comparative effectiveness research in this high-incidence population.

METHODS & MATERIALS

This prospective cohort study was conducted at the Department of Otolaryngology, Community Based Medical College Hospital Bangladesh, Mymensingh, over two years from January 2024 to December 2025. A consecutive series of 52 patients presenting with clinically suspicious, biopsy-proven primary buccal mucosal lesions was enrolled employing a purposive sampling technique.

Inclusion criteria: Patients were included if they were aged 18 years or older, had a histopathologically proven primary squamous cell carcinoma of the buccal mucosa, and had not received any prior definitive treatment (surgery, radiotherapy, or chemotherapy) for the current malignancy.

Exclusion criteria: Patients with recurrent tumors, those whose malignancy originated from adjacent subsites such as the gingivobuccal sulcus or retromolar trigone, individuals with a synchronous second primary malignancy, and those who declined to participate or were lost to initial follow-up assessment were excluded from the study.

Study procedure: Following enrollment, each patient underwent a comprehensive clinical assessment, including detailed history of risk factors and a complete head and neck examination with flexible nasopharyngolaryngoscopy. Clinical T, N, and M categories were assigned using the validated AJCC 8th edition TNM staging system [14]. All histopathological slides were reviewed by two independent pathologists blinded to clinical data. Tumor differentiation was categorized according to the Broders' grading system as well as moderately or poorly differentiated [15]. The presence of perineural invasion and lymphovascular invasion was systematically recorded.

Data analysis: Categorical variables were expressed as frequencies and percentages, while continuous data were expressed as mean ± standard deviation. The Chi-square test was applied to examine associations between clinicopathological factors and cervical nodal metastasis. All statistical analyses were executed using SPSS version 23.0, with a two-sided p-value < 0.05 considered statistically significant.

RESULT

A total of 52 patients with histologically proven buccal squamous cell carcinoma were enrolled in this prospective cohort study. The mean age of the cohort was 54.3 ± 11.2 years. Male patients predominated, accounting for 65.4% of the sample, while female patients comprised 34.6%, yielding a male-to-female ratio of approximately 1.9:1. Regarding primary tumor extent, T1 lesions were observed in 15.4% (n=8) of patients, while T2 tumors accounted for 25.0% (n=13). Advanced T3 and T4 tumors collectively represented the majority, at 59.6% (n=31), with T3 seen in 34.6% (n=18) and T4 in 25.0% (n=13) of cases. Cervical lymph node metastasis was clinically and radiologically evident in 42.3% (n=22) of the cohort, whereas 57.7% (n=30) presented with clinically negative necks (N0). Among those with nodal involvement, N1 disease was noted in 19.2% (n=10), N2 in 15.4% (n=8), and N3 in 7.7% (n=4). Histopathological evaluation revealed that moderately differentiated squamous cell carcinoma was the most frequent grade, observed in 53.8% (n=28) of specimens. Well-differentiated tumors were documented in 19.2% (n=10), while poorly differentiated histology constituted the remaining 26.9% (n=14). Perineural invasion was identified in 30.8% (n=16) of the resected or biopsied specimens, whereas lymphovascular invasion was present in a comparatively smaller subset of 23.1% (n=12). When the association between clinicopathological factors and cervical nodal metastasis was analyzed, advanced T-stage (T3/T4) demonstrated a strong positive correlation with nodal positivity. Specifically, 58.1% of patients with advanced T-stage had cervical nodal metastasis, compared to only 19.0% of those with early T-stage (T1/T2), and this difference was statistically significant ($p = 0.008$). Perineural invasion also emerged as a significant predictor, with nodal metastasis observed in 68.8% of patients exhibiting perineural invasion versus 30.6% of those without this feature, yielding a p-value of 0.010. Similarly, lymphovascular invasion was significantly associated with nodal spread, as 66.7% of patients with lymphovascular invasion had positive nodes, compared to 35.0% of those without it ($p = 0.048$). In contrast, histological tumor grade did not exhibit a statistically significant association with nodal metastasis; nodal positivity occurred in 20.0% of well-differentiated cases and 47.6% of moderately/poorly differentiated cases ($p = 0.114$). Further analysis of the interrelationship between histological grade and perineural invasion revealed a progressive increase in perineural invasion with dedifferentiation. Perineural invasion was present in only 10.0% of well-differentiated tumors, rising to 28.6% in moderately differentiated tumors and reaching 50.0% in poorly differentiated tumors. This trend was statistically significant ($p = 0.038$).

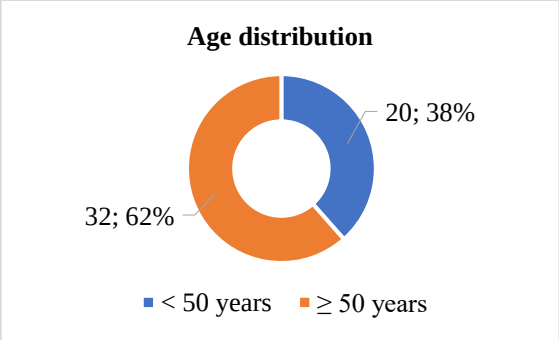

Figure 1 Age Distribution of Participants (*n*=52).

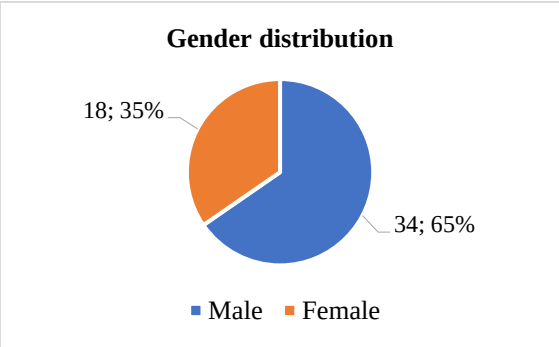

Figure 2 Gender distribution of participants.

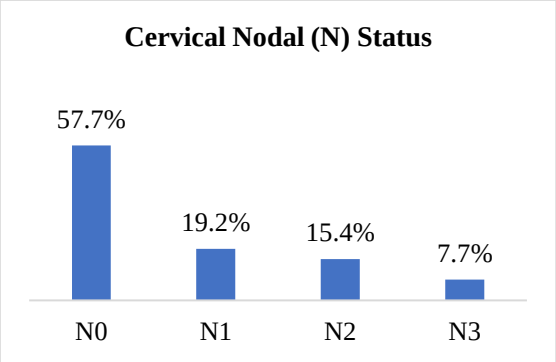

Figure 3 Distribution of Cervical Nodal (N) Status.

Table I
Histopathological Features of Buccal Carcinoma**.**

Feature	Category	n (%)
Histological grade	Well differentiated	10 (19.2)
	Moderately differentiated	28 (53.8)
	Poorly differentiated	14 (26.9)
Perineural invasion	Present	16 (30.8)
	Absent	36 (69.2)
Lymphovascular invasion	Present	12 (23.1)
	Absent	40 (76.9)

Table II
Association between Clinicopathological Factors and Cervical Nodal Metastasis.

Factor	Category	N0 (n=30) n (%)	N+ (n=22) n (%)	p-value
T-stage	Early (T1-T2)	17 (81.0)	4 (19.0)	0.008
	Advanced (T3-T4)	13 (41.9)	18 (58.1)	
Perineural invasion	Absent	25 (69.4)	11 (30.6)	0.010
	Present	5 (31.2)	11 (68.8)	
Lymphovascular invasion	Absent	26 (65.0)	14 (35.0)	0.048
	Present	4 (33.3)	8 (66.7)	
Histological grade	Well differentiated	8 (80.0)	2 (20.0)	0.114
	Moderately/Poorly differentiated	22 (52.4)	20 (47.6)	

Data analyzed using the Chi-square test. A p-value < 0.05 was considered statistically significant.

Table III
Association between Histological Grade and Perineural Invasion.

Histological Grade	PNI Present n (%)	PNI Absent n (%)	p-value
Well differentiated	1 (10.0)	9 (90.0)	0.038
Moderately differentiated	8 (28.6)	20 (71.4)	
Poorly differentiated	7 (50.0)	7 (50.0)	

DISCUSSION

The present prospective cohort study provides contemporary clinicopathological data on buccal squamous cell carcinoma from a tertiary care hospital in Bangladesh, a region where this malignancy remains highly prevalent. The findings demonstrate that the majority of patients present with advanced primary tumors, a substantial proportion exhibit cervical nodal metastasis, and perineural invasion emerges as a significant correlate of both nodal spread and histologic dedifferentiation. The mean age of 54.3 years in this cohort aligns closely with the peak incidence reported in other South Asian populations, where buccal carcinoma typically manifests in the fifth to sixth decades of life [3]. The male predominance observed (65.4%) is consistent with the known higher exposure to tobacco and betel quid products among males in this region [5,16]. However, the substantial female representation (34.6%) remains noteworthy, reflecting the widespread practice of smokeless tobacco use and areca nut chewing among women in rural Bangladesh, underscoring the need for gender-inclusive preventive strategies [6]. Advanced T-stage (T3/T4) was documented in 59.6% of patients, a figure comparable to previous regional reports, in which delayed presentation remains a persistent challenge [8]. This high proportion of locally advanced disease carries significant therapeutic implications, as such tumors often require complex resection and adjuvant therapy, with attendant morbidity. The observed cervical nodal metastasis rate of 42.3% further corroborates the aggressive nature of buccal carcinoma and is consistent with the 40-50% nodal positivity rates reported in Indian and Pakistani cohorts [8,17]. Notably, the strong correlation between advanced T-stage and nodal metastasis (p = 0.008) reaffirms the prognostic value of primary tumor extent as a predictor of regional spread, a relationship well documented in the literature [10,18]. With respect to histological grade, moderately differentiated squamous cell carcinoma predominated (53.8%), mirroring the distribution described in several Asian case series [2,19]. The progressive increase in perineural invasion with worsening differentiation—from 10.0% in well-differentiated tumors to 50.0% in poorly differentiated tumors (p = 0.038)—is a particularly noteworthy finding. This association has been observed in larger cohorts, where poor differentiation consistently predicts a higher likelihood of perineural invasion [12]. The biological plausibility of this relationship lies in the loss of cellular adhesion and increased invasive capacity characteristic of poorly differentiated neoplasms [7]. Perineural invasion was identified in 30.8% of specimens, a prevalence that falls within the 20-40% range reported in systematic reviews of oral squamous cell carcinoma [12]. The significant association between perineural invasion and cervical nodal metastasis observed in this study (68.8% nodal positivity among PNI-positive cases versus 30.6% among PNI-negative cases, p = 0.010) aligns with the emerging consensus that perineural invasion serves as a marker of aggressive tumor biology. A large retrospective analysis of 1,716 oral cancer patients demonstrated that PNI-positive tumors exhibited significantly higher rates of lymph node involvement (55.1% versus 30.8%) and were more frequently associated with advanced stage disease [9]. Furthermore, a comprehensive meta-analysis encompassing 23,580 patients confirmed that perineural invasion independently predicts worse overall survival, disease-free survival, and increased local recurrence, with hazard ratios ranging from 1.52 to 2.68 [12]. These convergent data suggest that perineural invasion should not be regarded merely as a histopathological curiosity but as a critical determinant of treatment planning. Lymphovascular invasion, identified in 23.1% of the present cohort, also demonstrated a significant association with nodal metastasis (p = 0.048), supporting its role as an adverse prognostic indicator. Population-based analyses have established lymphovascular invasion as an independent risk factor for decreased overall survival in oral cavity squamous cell carcinoma, including buccal subsite involvement [13,20]. The presence of lymphovascular invasion indicates the tumor's capacity for hematogenous and lymphatic dissemination, thereby justifying more aggressive surveillance and consideration of adjuvant systemic therapy in affected patients [11]. Contrary to expectation, histological grade alone did not achieve statistical significance in predicting nodal metastasis (p = 0.114), although a trend toward higher nodal positivity in moderately/poorly differentiated tumors was evident. This finding may reflect the relatively modest sample size and the confounding effect of other aggressive features such as perineural invasion and depth of invasion, which are known to correlate with both grade and nodal status [7,10]. Nonetheless, the significant association between grade and perineural invasion observed in this study suggests that differentiation remains an important albeit indirect predictor of aggressive behavior.

LIMITATIONS

The single-center design, purposive sampling, modest sample size, and lack of long-term survival follow-up limit the generalizability and preclude multivariable analysis, potentially introducing selection

bias toward advanced disease typically seen at tertiary referral centers.

CONCLUSION

Buccal carcinoma in this Bangladeshi cohort exhibits aggressive local features, with advanced T-stage and perineural invasion significantly predicting cervical nodal metastasis. The high prevalence of perineural invasion in poorly differentiated tumors underscores its value as a marker of aggressive biology. These findings emphasize the critical need for systematic pathological reporting and comprehensive multidisciplinary management in this high-incidence population.

RECOMMENDATION

Routine histopathological reporting must include perineural and lymphovascular invasion status for accurate risk stratification. Population-based screening programs and tobacco cessation campaigns are urgently needed to promote earlier diagnosis and reduce the burden of advanced-stage disease.

CONFLICT OF INTEREST

The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

AI DECLARATION

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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