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FREQUENCY OF ORAL SQUAMOUS CELL CARCINOMA OF MANDIBULAR ALVEOLUS IN PATIENTS PRESENTING TO AYUB TEACHING HOSPITAL ABBOTTABAD

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ABSTRACT:
Background: Mandibular alveolar squamous cell carcinoma is a malignant epithelial neoplasm of the squamous covering of the mandibular alveolar mucosa. It presents as a chronic ulcer and is an important cause of morbidity, especially in high-risk groups. Demographic correlations may inform early detection strategies.
Objective: To determine the frequency of oral squamous cell carcinoma of mandibular alveolus in patients attended by Ayub Teaching Hospital Abbottabad.
Study Design: Cross-sectional study.
Duration and Place of Study: This study was conducted from May 2025 to October 2025 in the Department of Dentistry, Ayub Teaching Hospital, Abbottabad.
Methodology: A total of 178 patients aged 20–80 years with histopathologically confirmed oral squamous cell carcinoma were enrolled through non-probability consecutive sampling. Demographic and clinical data were recorded, and mandibular alveolus involvement was documented. Stratification was performed for age, gender, and symptom duration. Associations were analyzed using chi-square or Fisher's exact test, with $p<0.05$ considered significant.
Results: The mean age was 50.50±9.80 years, and 87.6% were male. Mandibular alveolus involvement was observed in 54 patients (30.30%). A significant association was found with age ($p=0.035$), with higher frequency in patients ≤45 years (41.1%) compared to those >45 years (25.4%). Gender ($p=0.468$) and duration of symptoms ($p=0.994$) showed no significant associations.
Conclusion: Oral squamous cell carcinoma of the mandibular alveolus occurred in nearly one-third of cases, with age being a significant factor, underscoring the need for targeted screening in younger patients.

KEYWORDS: Oral squamous cell carcinoma, Mandibular alveolus, Age association, Epidemiology

INTRODUCTION

Mandibular alveolar squamous cell carcinoma (OSCC) is responsible for a large percentage of oral malignancies, with differences in prevalence in various geographic locations and groups of people.[1] Worldwide, OSCC makes up more than 90% of all oral malignancies, and of these, the mandibular alveolar site is a prevalent one, especially in groups with extreme exposure to alcohol, betel nut, and tobacco use.[2] The incidence is significantly increased in Southern and Southeast Asia, where the use of such substances is part of the culture and where the level of dental hygiene may not be optimal.[3] In Pakistan, hospital-based national studies have documented the mandibular alveolar involvement in a large percentage of OSCC and the presentation of the patients with the malignancy in an advanced state because of delayed presentation and lack of access to special attention.[4]

Epidemiologic findings also show the rising incidence of mandibular alveolus OSCC with advancing age, commonly occurring in the fifth to seventh life decades, with a male predominance ascribed to increased exposure to risk factors.[5] A gradual increase in female cases has, however, emerged in recent reports and may be attributed to the rising use of tobacco and betel nut by women in some communities.[6] Prevalence also varies with socioeconomic level, with the highest levels being encountered in poorer groups where preventive dental services are poor and the level of awareness regarding early warning signs of oral cancer is low.[7] Notably, prevalence trends are a reflection of lifestyle influences and disparities in medical coverage and highlight the appropriateness of screening in the presence of risk groups.[7]

At the local level, OSCC of the mandibular alveolus remains a public health concern, and the majority of the cases presenting in tertiary care hospitals have wide local spread and nodal metastasis.[8] Absence of screening programs for cancer of the mouth and cultural acceptability of modifiable risk factors for chewing are reasons for the persistence of otherwise high prevalence in Abbottabad and the neighboring districts.[10] Hospital-based cancer registries and scientific studies are essential in the determination of trends in prevalence, which can guide public health policies for early detection, community education, and reduction of modifiable risk factors.[11] Enhancing these measures is essential for the decrease in disease prevalence and better survival outcomes.

According to the National Comprehensive Cancer Network (NCCN), the anatomic subsites of oral squamous cell carcinoma include the buccal mucosa, alveolar ridge, tongue, hard palate, retromolar trigone, floor of the mouth, and mucosa of the lips. Among these, the buccal mucosa (n = 1050; 34.9%), tongue (n = 884; 29.4%), and alveolar ridge (n = 482; 16.0%) represent the three most frequently affected sites.[12]

It is necessary to carry out a study on mandibular alveolar oral squamous cell carcinoma in Abbottabad in order to meet the unavailability of local data on its incidence, clinicopathological patterns, and risk factors. Local epidemiologic knowledge may enable the discovery of demographic and lifestyle-specific factors, inform early detection programs, and assist in the formulation of customized treatment regimens, ultimately enhancing patient outcome in this population.

METHODOLOGY

This analytical cross-sectional study was conducted in the Department of Dentistry at Ayub Teaching Hospital, Abbottabad, from May 2025 to October 2025. Prior to commencement, approval was obtained from the institutional ethics review committee and the College of Physicians and Surgeons Pakistan. The sample size was calculated as 178 using the World Health Organization sample size calculator, based on an anticipated prevalence of 34.8%,[12] a 95% confidence level, and an absolute precision of 7%. Participants were selected through a non-probability consecutive sampling technique. Patients aged 20 to 80 years, of either sex, with histopathological confirmation of oral squamous cell carcinoma involving the mandibular alveolus, were eligible. Both newly diagnosed and recurrent cases were included. Exclusion criteria comprised squamous cell carcinoma arising from other oral or extra-oral sites, absence of histopathological confirmation, or biopsy reports from sources considered unreliable.

Eligible patients were approached, and informed consent was obtained from each participant or their legal guardian before any data collection. Confidentiality of patient information was maintained throughout. Following consent, baseline demographic data including age, sex, and residential address were recorded. Subsequently, a detailed medical history was obtained, and targeted clinical examination of the mandibular alveolus was performed, including inspection and palpation, along with cervical lymph node assessment. For any suspicious lesion, an incisional biopsy was carried out, and the specimen was sent to the pathology department for histopathological confirmation. All clinical and laboratory findings were documented in a predesigned proforma completed by the resident investigator.

Oral squamous cell carcinoma of the mandibular alveolus was considered a malignant epithelial tumor originating from the squamous lining of the mandibular alveolar mucosa, clinically presenting as a non-healing ulcer persisting for more than two weeks despite medical treatment, and confirmed through histopathology. Lesion duration was determined from patient or attendant history, and persistence was verified on clinical examination.

Data were analyzed using IBM SPSS Statistics version 22. Quantitative variables, such as age and duration of disease, were expressed as mean ± standard deviation, while categorical variables, such as sex and confirmed squamous cell carcinoma of the mandibular alveolus, were presented as frequencies and percentages. Stratification was performed for age, sex, and disease duration. Post-stratification analysis was conducted using the chi-square test, and Fisher's exact test was applied when cell counts were ≤5. A p-value <0.05 was considered statistically significant.

RESULTS

The study included 178 patients with a mean age of 50.50±9.80 years, mean duration of symptoms of 13.60±9.86 months, and mean weight of 66.18±10.79 kg. The cohort was predominantly male, comprising 156 patients (87.6%), while females represented 22 patients (12.4%) (as shown in Table I).

Table I: Patient Demographics; N=178

Demographics	**Mean ± SD**
Age (years)	50.50±9.80
Duration of symptoms (months)	13.60±9.86
Weight (kg)	66.18±10.79
Gender	
Male n (%)	156 (87.6%)
Female n (%)	22 (12.4%)

The overall frequency of oral squamous cell carcinoma of mandibular alveolus was found in 54 patients (30.30%), while 124 patients (69.70%) did not have mandibular alveolus involvement (as shown in Table II).

Table II: Frequency of Oral Squamous Cell Carcinoma of Mandibular Alveolus

Mandibular Alveolus OSCC	**Frequency**	**% age**
Yes	54	30.30%
No	124	69.70%
Total	178	100%

When examining the association between demographic factors and mandibular alveolus OSCC, age demonstrated a statistically significant relationship (p=0.035), with patients aged ≤45 years showing a higher frequency of mandibular alveolus involvement at 23 patients (41.1%) compared to 33 patients (58.9%) without involvement, while patients >45 years had 31 cases (25.4%) with involvement versus 91 cases (74.6%) without involvement. Gender distribution showed no significant association with mandibular alveolus OSCC (p=0.468), with males having 49 cases (31.4%) with involvement and 107 cases (68.6%) without involvement, while females had 5 cases (22.7%) with involvement and 17 cases (77.3%) without involvement. Duration of symptoms also showed no significant association (p=0.994), with patients having symptoms ≤12 months showing 34 cases (30.4%) with involvement and 78 cases (69.6%) without involvement, compared to patients with symptoms >12 months having 20 cases (30.3%) with involvement and 46 cases (69.7%) without involvement (as shown in Table III).

Table III: Association of Oral Squamous Cell Carcinoma of Mandibular Alveolus with Demographic Factors

Demographic Factors		Mandibular Alveolus OSCC		p-value
		Yes n(%)	No n(%)	
Age (years)	≤45	23 (41.1%)	33 (58.9%)	0.035
	>45	31 (25.4%)	91 (74.6%)	
Gender	Male	49 (31.4%)	107 (68.6%)	0.468
	Female	5 (22.7%)	17 (77.3%)	
Duration of symptoms (months)	≤12	34 (30.4%)	78 (69.6%)	0.994
	>12	20 (30.3%)	46 (69.7%)	

DISCUSSION

This current study sought to establish the prevalence of oral squamous cell carcinoma of the mandibular alveolus and found a prevalence of 30.30% in the sampled population, revealing that one-third of oral squamous cell carcinomas show preference for involvement of this specific anatomical location. The relatively high prevalence can be ascribed to the specific anatomical features of the alveolar region of the mandible, which offers direct accessibility to common carcinogens such as tobacco articles, betel quid, and irritative effects of ill-fitting dental appliances on a chronic basis, rendering the alveolar region a vulnerable area for malignant transition. The high male dominance presented in the current research (87.6% males, 12.4% females) mirrors the established pattern of oral squamous cell carcinoma, which can be accounted for on the basis of the higher prevalence of tobacco usage, alcohol intake, and occupational exposure to carcinogens in males, in addition to hormonal disparities liable to predispose cells to malignant transition. The mean age of 50.50±9.80 years provides the characteristic demographical profile for oral squamous cell carcinoma, as this age range encompasses the cumulative host effects of widespread exposure to carcinogens over a long period, with ample time for the multi-step carcinogenesis process to be initiated, as cells' repair mechanisms start to weaken in later life.

The strong correlation of younger age (≤45 years) and mandibular alveolar involvement (p=0.035) is a remarkable finding which runs counter to the general intuition of elevated malignancy risk in increased age. This phenomenon can be explained as one of aggressive biological behavior and rapid progression which frequently occur in youthful individuals suffering from oral squamous cell carcinoma, in whom genetic predisposition, infection by the human papillomavirus, or exposure to high-power carcinogens at a younger age can play a role in the development of site-specific tumors. The absence of correlation of gender and mandibular alveolar involvement (p=0.468) confirms that whereas males remain at higher risk of developing oral squamous cell carcinoma in general, the anatomical site predilection of tumor does not depend on gender-specific characteristics, and local environmental and mechanistic factors may be much more decisive in determining tumor location than systemic hormonal effects. Correspondingly, the absence of correlation of symptom duration and mandibular alveolar involvement (p=0.994) implies that the sitetpecific characteristic of tumor development is decided at an early period of the carcinogenesis process based on local tissue characteristics and patterns of exposure rather than on the temporal course of the disease process.

Our findings demonstrate notable similarities and differences when compared to regional studies examining oral squamous cell carcinoma patterns. The mandibular alveolar frequency of 30.30% in our study shows consistency with Tandon P, et al. [13] who reported mandibular alveolus involvement at 21.50%, indicating similar regional predilection for this anatomical site across South Asian populations, likely due to comparable smokeless tobacco consumption patterns and cultural practices involving direct contact of carcinogenic substances with alveolar tissues. However, Ismail, et al. [14] reported a substantially higher alveolar ridge frequency of 54.55%, which may be attributed to their broader anatomical definition encompassing both maxillary and mandibular alveolar regions or variations in local exposure patterns to specific carcinogens.

The gender distribution in our study (87.6% males, 12.4% females) reveals more pronounced male predominance compared to other regional studies, with Sawair FA, et al. [15] showing 53.6% males versus 46.4% females, Ismail, et al. [14] demonstrating 70.0% males versus 30.0% females, and Tandon P, et al. [13] reporting 59.01% males versus 40.98% females. This variation reflects differences in cultural norms regarding tobacco consumption,

occupational carcinogen exposure, and gender-specific lifestyle factors across different geographical regions and socioeconomic backgrounds. Notably, while Ismail, et al. [14] found all alveolar ridge cases occurred exclusively in males with significant gender-site association ($p<0.001$), our study showed no significant gender association with mandibular alveolar involvement ($p=0.468$), suggesting that local cultural practices and gender-specific exposure patterns influence site predilection differently across populations.

Age demographics demonstrate remarkable consistency across studies, with our mean age of 50.50±9.80 years closely matching Sawair FA, et al. [15] at 51.1±16.9 years, Ismail, et al. [14] at 53.74±12.79 years, and Nisar W, et al. [16] at 57±9.91 years, indicating uniform age-related susceptibility patterns for oral squamous cell carcinoma across South Asian and Middle Eastern populations due to similar cumulative carcinogen exposure timelines and age-related decline in cellular repair mechanisms. However, our unique finding of significantly higher mandibular alveolar involvement in younger patients (≤45 years showing 41.1% involvement versus >45 years showing 25.4% involvement, $p=0.035$) contrasts with the general oncological principle of increasing cancer risk with advancing age, possibly explained by aggressive tumor biology, genetic predisposition, or early intensive carcinogen exposure in younger demographics that specifically targets mandibular alveolar tissues through direct contact mechanisms.

A number of limitations should be taken into account in interpreting these results. The single-center study design may restrict generalizability of the results to larger population groups and other healthcare environments having varied referral patterns and patient populations. The study has not investigated histopathological grading, TNM staging, and survival outcomes, which would be interesting to know to interpret the clinical relevance of mandibular alveolar involvement. Lack of complete tobacco consumption patterns, exposure duration, and specific product types consumed by the cases constitutes another limitation that may affect the interpretation of site-specific predilection patterns. The relatively modest sample size may be inadequate to demonstrate subtle correlations between demographic variables and mandibular alveolar involvement, especially in subgroup analyses.

CONCLUSION

Our research has found that oral squamous cell carcinoma of the mandibular alveolus accounts for a major proportion of oral cancers, which has a high male predominance and highest incidence in middle-aged individuals. The strong correlation of younger age and mandibular alveolar involvement indicates specific patterns of biological behavior which require a closer look as well as specific clinical focus. Gender and symptom duration, in turn, were found to be not significantly related to involvement of the mandibular alveolus, but overall demographic patterns conform to known patterns of oral squamous cell carcinoma in South Asia epidemiology.

Conflict of interest: None

Disclaimer: None

Acknowledgments: Our profound gratitude goes to the department's healthcare professionals, whose meticulous recordkeeping and organized handling of patient information have been indispensable to this work.

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