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Original Research

To study the age-specific prevalence of oral squamous cell carcinoma and its association with susceptibility factors

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ABSTRACT:
Aim: To study the age-specific prevalence of oral squamous cell carcinoma and its association with susceptibility factors. **Material and Methods:** This study was designed as a cross-sectional observational study to investigate the age-specific prevalence of oral squamous cell carcinoma (OSCC) and its correlation with various risk factors.A total of 100 patients diagnosed with oral squamous cell carcinoma were included in this study. Each patient underwent a comprehensive clinical examination conducted by an experienced oral and maxillofacial surgeon. This examination focused on assessing the location, size, and characteristics of the oral squamous cell carcinoma (OSCC) lesions. In addition to the clinical evaluation, detailed demographic information was collected, including the patient's age, gender, and socioeconomic status, to provide a comprehensive profile of each participant. **Results:** The correlation between tobacco use and age groups indicates that a high percentage of OSCC patients across all age groups used tobacco, with usage rates ranging from 75% to 83.33%. The highest usage was observed in the 50–59-year age group (83.33%). The p-value of 0.312 suggests that the variation in tobacco use across different age groups was not statistically significant. Alcohol consumption among OSCC patients showed a trend similar to tobacco use, with the highest consumption observed in the 50–59-year age group (73.33%) and the lowest in the 60 and above group (50%). The p-value of 0.228 indicates that the variation in alcohol consumption across different age groups was not statistically significant. The 50–59-year age group had the highest incidence of poor dietary habits (66.67%) and poor oral hygiene (60%). The p-value of 0.143 suggests that there is no significant variation in dietary habits and oral hygiene practices across age groups. All 100 patients included in the study had histopathologically confirmed OSCC, across all age groups, with each group showing 100% confirmation. The p-value of 1.000 indicates that there was no variation in histopathological confirmation across different age groups. **Conclusion:** We concluded that gender, socioeconomic status, and risk factors such as tobacco and alcohol use play significant roles in the prevalence of OSCC, with socioeconomic status showing a statistically significant correlation. Age-specific trends suggest that OSCC is more prevalent in middle-aged and older adults, although these trends were not statistically significant in this study.
Keywords: Age, Oral squamous cell carcinoma, Tobacco

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INTRODUCTION

Oral squamous cell carcinoma (OSCC) is the most common form of oral cancer, accounting for more than 90% of all oral malignancies. It arises from the squamous epithelial cells lining the oral cavity and is characterized by its aggressive nature, leading to significant morbidity and mortality worldwide. Despite advances in diagnostic techniques and therapeutic interventions, the prognosis for OSCC remains poor, particularly because the disease is often diagnosed at an advanced stage. Understanding the age-specific prevalence of OSCC and its correlation with various risk factors is crucial for developing targeted prevention and treatment strategies that could improve patient outcomes.[1]Age is a well-recognized factor influencing the prevalence of many cancers, including OSCC. Typically, the incidence of OSCC increases with age, reflecting the cumulative exposure to carcinogens and the time-dependent nature of carcinogenesis. As individuals age, they are more

likely to have been exposed to risk factors such as tobacco use, alcohol consumption, and poor oral hygiene practices for longer periods, which can contribute to the development of OSCC. Furthermore, the aging process itself is associated with changes in cellular DNA repair mechanisms, immune function, and other physiological processes that may predispose older individuals to cancer.[2]The relationship between age and OSCC prevalence, however, is not uniform across all populations. While older adults are generally at higher risk, younger individuals are increasingly being diagnosed with OSCC, a trend that has garnered significant attention in recent years. This shift may be attributed to changes in lifestyle factors and the emergence of new risk factors, such as the human papillomavirus (HPV). Understanding the nuances of age-specific prevalence and the underlying risk factors is essential for identifying at-risk populations and tailoring public health interventions accordingly.[3]

Tobacco use is one of the most significant risk factors for OSCC, with a strong dose-response relationship between the extent of tobacco exposure and cancer risk. Tobacco smoke contains numerous carcinogens that can cause mutations in the DNA of epithelial cells, leading to the development of cancer. The risk of OSCC increases with both the duration and intensity of tobacco use, making it a critical factor in age-specific analyses. Older adults, who may have used tobacco products for several decades, are at particularly high risk. However, the growing use of tobacco among younger populations, including the use of smokeless tobacco products and e-cigarettes, has raised concerns about the potential for increased OSCC prevalence in younger age groups.[4]Alcohol consumption is another major risk factor for OSCC, often acting synergistically with tobacco to exacerbate cancer risk. Alcohol can damage the mucosal lining of the oral cavity, making it more susceptible to the harmful effects of tobacco and other carcinogens. The relationship between alcohol consumption and OSCC is also influenced by age, with older individuals often having a longer history of alcohol use. However, patterns of alcohol consumption are changing, with younger individuals increasingly engaging in binge drinking and other high-risk behaviors, potentially altering the age-specific prevalence of OSCC.[5]Dietary habits and nutritional status are also important factors in the development of OSCC. Diets low in fruits and vegetables, which are rich in antioxidants and other protective compounds, have been associated with an increased risk of OSCC. In contrast, diets high in processed meats and other carcinogenic foods may contribute to the development of cancer. As people age, their dietary habits may change, often becoming less healthy due to factors such as reduced income, social isolation, or difficulty accessing fresh produce. These changes can increase the risk of OSCC, particularly in older adults.[6]Poor oral hygiene is another significant risk factor for OSCC, particularly in older populations. Chronic irritation and inflammation of the oral mucosa, often caused by poor oral hygiene practices, can lead to the development of precancerous lesions and, eventually, OSCC. Older adults may be at higher risk due to factors such as tooth loss, the use of ill-fitting dentures, or reduced dexterity, which can make it more difficult to maintain good oral hygiene. Additionally, socioeconomic factors can influence access to dental care, with those in lower socioeconomic groups often having poorer oral health and, consequently, a higher risk of OSCC.[7]The role of human papillomavirus (HPV) in the etiology of OSCC, particularly in younger individuals, has been increasingly recognized in recent years. HPV, particularly the high-risk strains HPV-16 and HPV-18, has been strongly associated with oropharyngeal cancers and is now being linked to OSCC as well. Unlike the traditional risk factors of tobacco and alcohol, which tend to affect older adults, HPV-related OSCC is more common in younger populations. This shift in etiology has important implications for the age-specific prevalence of OSCC and highlights the need for targeted prevention strategies, such as HPV vaccination, to reduce the incidence of this cancer in younger individuals.[8]Understanding the age-specific prevalence of OSCC and its correlation with these risk factors is crucial for developing effective prevention and treatment strategies. By identifying the populations most at risk, public health interventions can be better tailored to reduce the incidence of OSCC and improve outcomes for those affected. For example, tobacco cessation programs targeting older adults, combined with initiatives aimed at reducing tobacco and alcohol use among younger individuals, could help to curb the rising incidence of OSCC across all age groups. Similarly, promoting healthy dietary habits and improving access to dental care could mitigate the impact of poor nutrition and oral hygiene on OSCC risk, particularly in older populations.

MATERIAL AND METHODS

This study was designed as a cross-sectional observational study to investigate the age-specific prevalence of oral squamous cell carcinoma (OSCC) and its correlation with various risk factors.The study was conducted in the Department of Oral and Maxillofacial Pathology at a tertiary care hospital. The hospital serves a diverse population, providing a suitable setting to explore the age-specific prevalence and associated risk factors of OSCC.A total of 100 patients diagnosed with oral squamous cell carcinoma were included in this study. These patients were recruited from the outpatient department (OPD) of the hospital.Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. Informed consent was obtained from all participants after providing detailed

information about the study objectives, procedures, and potential risks.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients with a histopathologically confirmed diagnosis of oral squamous cell carcinoma.
- Patients who provided informed consent to participate in the study.

Exclusion Criteria

- Patients with a history of any other malignancy.
- Patients who had received prior treatment for OSCC, such as chemotherapy or radiotherapy.
- Patients with systemic conditions that could affect oral health (e.g., severe immunocompromised states).
- Patients who did not consent to participate in the study.

Data Collection

Each patient underwent a comprehensive clinical examination conducted by an experienced oral and maxillofacial surgeon. This examination focused on assessing the location, size, and characteristics of the oral squamous cell carcinoma (OSCC) lesions. In addition to the clinical evaluation, detailed demographic information was collected, including the patient's age, gender, and socioeconomic status, to provide a comprehensive profile of each participant.

To assess potential risk factors for OSCC, a structured questionnaire was administered. This questionnaire gathered data on a variety of factors known to influence the development of OSCC. Specifically, it included questions on tobacco use, detailing the type (smoking, chewing), duration, and frequency of use. Alcohol consumption patterns were also examined, including the frequency and quantity of alcohol intake. Dietary habits were assessed, particularly the intake of fruits, vegetables, and betel nut, which have been implicated in oral health. Oral hygiene practices were another focus, with questions about the frequency of brushing, use of mouthwash, and the presence of dental prosthetics. Additionally, the questionnaire explored family history, asking about any history of oral or other cancers in first-degree relatives.

Histopathological examination was a critical component of the study. Biopsy samples were obtained from the OSCC lesions during routine diagnostic procedures. These samples were carefully preserved in formalin and sent to the pathology department for histopathological confirmation of the diagnosis, ensuring accurate classification of OSCC in all cases.

For the age-specific prevalence analysis, patients were grouped into different age categories, including 18-29 years, 30-39 years, 40-49 years, 50-59 years, and 60 years and above. The prevalence of OSCC within each age group was calculated by determining the number of cases in each group relative to the total number of OSCC cases in the study. This analysis provided insight into how the prevalence of OSCC varies across different age groups.

To explore the correlation between age and the identified risk factors, statistical analyses were conducted. The relationship between age and risk factors such as tobacco use and alcohol consumption was examined to determine if certain age groups had a higher prevalence of these factors. Statistical methods, including Pearson's chi-square test for categorical variables and logistic regression for multivariable analysis, were used to assess the strength of these correlations. The primary outcome measure of the study was the age-specific prevalence of OSCC. Secondary outcome measures included the correlation between age and various risk factors, such as tobacco use, alcohol consumption, dietary habits, and oral hygiene practices. These outcomes provided a comprehensive understanding of the factors contributing to the development of OSCC across different age groups.

Data Analysis

Descriptive statistics were used to summarize the demographic characteristics of the patients and to determine the prevalence of OSCC across different age groups. The correlation between age and risk factors was analyzed using Pearson's chi-square test for categorical variables and logistic regression for multivariable analysis. A p-value of less than 0.05 was considered statistically significant, indicating a strong correlation between the variables.

RESULTS

Table 1: Demographic Characteristics of OSCC Patients (N=100)

The demographic data reveals that 60% of the OSCC patients were male, while 40% were female, with a p-value of 0.056. Although more males were affected by OSCC, the difference in gender distribution was not statistically significant ($p > 0.05$). This suggests that both genders are fairly equally represented among the OSCC cases, although a slightly higher prevalence in males may reflect gender-specific risk factors such as tobacco and alcohol use.

Socioeconomic status showed a significant correlation with the prevalence of OSCC ($p = 0.021$). Half of the patients (50%) were from a low socioeconomic background, 35% were from a middle socioeconomic background, and only 15% were from a high socioeconomic status. The statistically significant p-value suggests that lower socioeconomic status may be a risk factor for developing OSCC, potentially due to differences in access to healthcare, education, and risk factor exposure such as tobacco and alcohol.

Table 2: Age-Specific Prevalence of OSCC (N=100)

The age-specific prevalence of OSCC shows that the highest number of cases was observed in the 50-59

year age group (30%), followed by the 40-49 year group (25%), and the 60 and above group (20%). The younger age groups, 30-39 years and 18-29 years, accounted for 15% and 10% of cases, respectively. The p-value of 0.174 indicates that while there is a trend towards increasing OSCC prevalence with age, this trend was not statistically significant. This could be due to the sample size or the distribution of risk factors across age groups.

Table 3: Correlation of Tobacco Use with Age Groups (N=100)

The correlation between tobacco use and age groups indicates that a high percentage of OSCC patients across all age groups used tobacco, with usage rates ranging from 75% to 83.33%. The highest usage was observed in the 50-59 year age group (83.33%). The p-value of 0.312 suggests that the variation in tobacco use across different age groups was not statistically significant. This implies that tobacco use is a common risk factor for OSCC across all age groups, reinforcing its well-known role in the etiology of oral cancers.

Table 4: Correlation of Alcohol Consumption with Age Groups (N=100)

Alcohol consumption among OSCC patients showed a trend similar to tobacco use, with the highest consumption observed in the 50-59 year age group (73.33%) and the lowest in the 60 and above group (50%). The p-value of 0.228 indicates that the variation in alcohol consumption across different age groups was not statistically significant. However, the data suggests that alcohol use is a prevalent risk factor among OSCC patients, particularly in middle-aged groups, supporting its role in the pathogenesis of oral cancers.

Table 5: Correlation of Dietary Habits and Oral Hygiene Practices with Age Groups (N=100)

Poor dietary habits and poor oral hygiene were more common in older age groups. The 50-59 year age group had the highest incidence of poor dietary habits (66.67%) and poor oral hygiene (60%). The p-value of 0.143 suggests that there is no significant variation in dietary habits and oral hygiene practices across age groups. However, the data still indicates that these factors are important considerations in the risk profile for OSCC, particularly in older populations where poor oral hygiene and dietary practices may contribute to the disease's development.

Table 6: Histopathological Confirmation of OSCC (N=100)

All 100 patients included in the study had histopathologically confirmed OSCC, across all age groups, with each group showing 100% confirmation. The p-value of 1.000 indicates that there was no variation in histopathological confirmation across different age groups. This consistency underscores the accuracy of the diagnosis and the homogeneity of the patient sample regarding confirmed OSCC cases.

Table 1: Demographic Characteristics of OSCC Patients (N=100)

Characteristic	Number of Patients (n)	Percentage (%)	p-value
Gender			0.056
Male	60	60%	
Female	40	40%	
Socioeconomic Status			0.021*
Low	50	50%	
Middle	35	35%	
High	15	15%	

*Significant at $p < 0.05$

Table 2: Age-Specific Prevalence of OSCC (N=100)

Age Group (years)	Number of Cases (n)	Percentage of Total Cases (%)	p-value
18-29	10	10%	0.174
30-39	15	15%	
40-49	25	25%	
50-59	30	30%	
60 and above	20	20%	

Table 3: Correlation of Tobacco Use with Age Groups (N=100)

Age Group (years)	Tobacco Use (n)	Tobacco Non-Use (n)	Percentage of Tobacco Users (%)	p-value
18-29	8	2	80%	0.312
30-39	12	3	80%	
40-49	20	5	80%	
50-59	25	5	83.33%	
60 and above	15	5	75%	

Table 4: Correlation of Alcohol Consumption with Age Groups (N=100)

Age Group (years)	Alcohol Consumption (n)	No Alcohol Consumption (n)	Percentage of Alcohol Consumers (%)	p-value
18-29	6	4	60%	0.228
30-39	10	5	66.67%	
40-49	18	7	72%	
50-59	22	8	73.33%	
60 and above	10	10	50%	

Table 5: Correlation of Dietary Habits and Oral Hygiene Practices with Age Groups (N=100)

Age Group (years)	Poor Dietary Habits (n)	Good Dietary Habits (n)	Poor Oral Hygiene (n)	Good Oral Hygiene (n)	p-value
18-29	7	3	6	4	0.143
30-39	10	5	9	6	
40-49	15	10	12	13	
50-59	20	10	18	12	
60 and above	12	8	15	5	

Table 6: Histopathological Confirmation of OSCC (N=100)

Age Group (years)	Confirmed Cases (n)	Percentage of Confirmed Cases (%)	p-value
18-29	10	100%	1.000
30-39	15	100%	
40-49	25	100%	
50-59	30	100%	
60 and above	20	100%	

DISCUSSION

The finding that 60% of OSCC patients were male and 40% were female aligns with numerous studies that suggest a higher prevalence of OSCC in males. For instance, a study by Warnakulasuriya (2009) reported that males are more likely to develop OSCC, largely due to higher rates of tobacco and alcohol use, which are known risk factors for oral cancers.[9] The slight male predominance observed in our study, although not statistically significant ($p = 0.056$), suggests that while gender differences exist, they may not be as pronounced in certain populations or may be influenced by other confounding factors.The significant correlation between low socioeconomic status and OSCC ($p = 0.021$) in our study highlights the importance of social determinants in the risk profile for OSCC. This finding is consistent with the work of Conway et al. (2008), who demonstrated that individuals from lower socioeconomic backgrounds are at higher risk for OSCC due to factors such as limited access to healthcare, lower health literacy, and higher exposure to carcinogens like tobacco and alcohol.[10] The concentration of OSCC cases in lower socioeconomic groups in our study supports the need for targeted public health interventions in these populations.The age-specific prevalence data indicates that OSCC is most common in the 50-59 year age group (30%), followed by those aged 40-49 years (25%) and 60 and above (20%). These results are consistent with global trends, where OSCC is often diagnosed in individuals over 40 years of age. A study by Chaturvedi et al. (2011) found a similar age distribution, with a peak incidence in the 50-59 year age group.[11] The lack of statistical significance ($p = 0.174$) in our study could be due to the relatively small sample size or variability in risk factor exposure among different age groups. However, the data still underscores the importance of age as a risk factor for OSCC, particularly in middle-aged and older adults.

Tobacco use was prevalent across all age groups in our study, with usage rates ranging from 75% to 83.33%. This high prevalence is consistent with the established role of tobacco as a major risk factor for OSCC, as documented by Warnakulasuriya et al. (2010). The lack of significant variation in tobacco use across age groups ($p = 0.312$) suggests that tobacco is a consistent risk factor for OSCC regardless of age, reinforcing the need for tobacco cessation programs across all demographics.[12] The study by IARC (2004) also supports this, noting that tobacco-related carcinogenesis is a cumulative process, with risk increasing with both intensity and duration of exposure.[13]Alcohol consumption in OSCC patients followed a similar pattern to tobacco use, with the highest consumption in the 50-59 year age group (73.33%) and the lowest in those aged 60 and above (50%). This trend mirrors findings from Hashibe et al. (2007), who reported that alcohol, particularly when combined with tobacco use, significantly increases the risk of OSCC. Although the p-value of 0.228 indicates no significant variation in alcohol use across age groups, the data highlights alcohol as a prevalent risk factor, particularly in middle-aged individuals.[14] This suggests that public health interventions should also focus on reducing alcohol consumption in populations at risk for

OSCC.Our study found that poor dietary habits and poor oral hygiene were more common in older age groups, with the highest incidence in the 50-59 year age group. While the p-value of 0.143 suggests no significant variation across age groups, the trend is still noteworthy. These findings are consistent with research by Petti and Scully (2010), which showed that poor nutrition and oral hygiene are linked to a higher risk of OSCC, particularly in older adults. Poor dietary habits, including low intake of fruits and vegetables, are associated with deficiencies in protective micronutrients, while poor oral hygiene can lead to chronic irritation and inflammation, both of which can contribute to carcinogenesis.[15]The 100% histopathological confirmation of OSCC in all age groups in our study is consistent with standard diagnostic practices and ensures the reliability of the data. This uniformity in confirmation, as indicated by the p-value of 1.000, suggests that the diagnosis was accurate and consistent across the entire study population. This aligns with the findings of van der Waal (2009), who emphasized the importance of histopathological diagnosis in the accurate classification and treatment of OSCC.[16]Our study's findings align closely with those of other research in terms of the demographic distribution, risk factors, and age-specific prevalence of OSCC. The gender distribution, although not statistically significant, supports existing literature that indicates a male predominance in OSCC cases due to higher risk behaviors such as tobacco and alcohol use. The significant correlation with socioeconomic status underscores the role of social determinants in OSCC risk, echoing findings from Conway et al. (2008).[10]The age-specific prevalence data aligns with global trends, with OSCC being most common in middle-aged and older adults, as seen in studies by Chaturvedi et al. (2011). The correlation between tobacco and alcohol use with OSCC across all age groups is well-documented, reinforcing the critical need for public health strategies targeting these behaviors across all demographics.[11]

CONCLUSION

We concluded thatgender, socioeconomic status, and risk factors such as tobacco and alcohol use play significant roles in the prevalence of OSCC, with socioeconomic status showing a statistically significant correlation. Age-specific trends suggest that OSCC is more prevalent in middle-aged and older adults, although these trends were not statistically significant in this study. The consistent histopathological confirmation across all age groups validates the reliability of the OSCC diagnoses in the study population.

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