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Research Article

Advanced Head and Neck Squamous Cell Carcinoma: 3-Year Survival Statistics in Western Maharashtra

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Abstract

Background: Advanced head and neck squamous cell carcinoma (HNSCC) is associated with considerable morbidity and mortality, particularly in India, where tobacco and alcohol consumption contribute to disease burden.
Aim/Objectives: To evaluate three-year survival outcomes and assess associations between survival and demographic, clinical, tumour-related, and treatment factors among patients with advanced HNSCC in Western Maharashtra.
Materials and Methods: This retrospective observational study included 45 patients treated at a tertiary care centre during 2022, with follow-up from 2023 to 2025. Clinical records and survival outcomes were analysed using SPSS version 27.0. Categorical variables were compared using appropriate statistical tests, with $p \leq 0.05$ considered statistically significant.
Result: A total of 45 patients were included, with male predominance (77.8%, n=35). Most patients were below 60 years (57.8%, n=26). The tongue was the most common tumour site (35.6%, n=16), and well-differentiated carcinoma was the predominant histological type (48.9%, n=22). Stage IVA disease was most frequent (62.2%, n=28). Combined surgery and chemoradiotherapy was administered to 62.2% (n=28), while 37.8% (n=17) received chemoradiotherapy alone. Overall, 55.6% (n=25) of patients were alive and 44.4% (n=20) had died at the reported follow-up. Survival was higher among patients below 60 years (69.23%) than older patients (36.84%). Survival decreased with increasing number of addictions (68.18%, 52.94%, and 16.67% for one, two, and three addictions, respectively). Stage-wise survival rates were 71.43%, 51.85%, and 0% for Stages III, IVA, and IVB, respectively. Survival was higher among patients receiving combined surgery and chemoradiotherapy (82.14%) than among those receiving chemoradiotherapy alone (11.76%).
Conclusion: Advanced head and neck squamous cell carcinoma showed a male predominance, with the tongue being the most frequently affected site and Stage IVA being the most common presentation. Higher observed survival was noted among patients aged below 60 years and those receiving combined surgery and chemoradiotherapy. Survival also tended to decrease with advancing disease stage and an increasing number of addictions. Early diagnosis and appropriate multimodality treatment may improve patient outcomes; however, larger studies with detailed follow-up are required to validate these findings.

Keywords: Head and neck squamous cell carcinoma; Three-year survival; Prognostic factors; Disease stage; Chemoradiotherapy; Multimodality treatment.

Introduction

Head and neck squamous cell carcinoma (HNSCC) is a significant public health concern, particularly in South Asia, where tobacco consumption, alcohol use, and areca nut chewing contribute substantially to disease development. The disease commonly affects the oral cavity, tongue, oropharynx, hypopharynx, and larynx, with considerable variation in clinical presentation and prognosis according to anatomical site and disease stage [1,2]. Global cancer statistics continue to demonstrate a substantial burden of head and neck malignancies, emphasizing the need for effective prevention, early diagnosis, and timely treatment [3].

India carries a particularly high burden of head and neck cancer. An analysis of 37 population-based cancer registries reported age-standardized incidence rates of 25.9 per 100,000 males and 8.0 per 100,000 females, highlighting considerable differences between sexes and geographical regions [4]. Tobacco chewing, smoking, and alcohol consumption remain important preventable risk factors, while human papillomavirus infection is particularly relevant to selected oropharyngeal cancers [1,5]. Despite improvements in diagnostic procedures and multidisciplinary treatment, many patients continue to present with locally advanced disease, which may adversely affect survival [6].

Survival following HNSCC depends on several factors, including age, anatomical site, histopathological differentiation, clinical stage, comorbidities, treatment selection, and access to healthcare services [2,7]. Recent Indian population-based evidence has demonstrated considerable geographical variation in oral cancer survival, suggesting that differences in disease characteristics and healthcare accessibility may influence patient outcomes [8,9]. Consequently, evaluating survival over a defined follow-up period can provide valuable information regarding treatment outcomes and prognostic factors in specific populations.[10]

The present study aims to evaluate the three-year survival outcomes of patients with advanced head and neck squamous cell carcinoma treated at a tertiary care centre in Western Maharashtra. It also seeks to examine the association between survival and important clinical and demographic factors, including age, addiction history, anatomical site, disease stage, and treatment modality, to identify factors potentially influencing mortality and to provide insights for improving patient management and long-term outcomes.

Materials and Methods

Study Design: A retrospective observational study was conducted to assess three-year survival outcomes in patients with advanced head and neck squamous cell carcinoma.

Study Population: Patients diagnosed with head and neck squamous cell carcinoma and treated at a tertiary care centre were included.

Sample Size: A total of 45 patients were included in the study.

Study Duration: Patients treated in 2022 were followed up for three years, from 2023 to 2025.

Study Setting/Location: A tertiary care centre in Western Maharashtra, India.

Inclusion Criteria:

- Patients diagnosed with head and neck squamous cell carcinoma.
- Patients treated at the study centre during 2022.
- Patients with documented clinical details, treatment records, and survival outcomes.

Exclusion Criteria:

- Patients with incomplete medical or treatment records.
- Patients with unavailable- survival or follow-up information.
- Patients with histopathological diagnoses other than squamous cell carcinoma.

Statistical Analysis: Data were initially entered into Microsoft Excel and subsequently analyzed using SPSS software (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between independent groups were performed using the independent samples t-test, whereas paired t-tests were applied for correlated (paired) data. Categorical variables were analyzed using

the Chi-square test, and Fisher's exact test was employed when expected frequencies were small. A p-value ≤ 0.05 was considered statistically significant.

Result

Table 1. Sociodemographic Characteristics of the Study Population

Characteristic		Frequency (n)	Percentage (%)
Gender	Male	35	77.8
	Female	10	22.2
Age group	Below 60 years	26	57.8
	Above 60 years	19	42.2
	Total	45	100

Table 2. Clinical and Tumour Characteristics of Patients

Characteristic		Frequency (n)	Percentage (%)
Anatomical site	Tongue	16	35.6
	Buccal mucosa	10	22.2
	Larynx	10	22.2
	Maxilla	5	11.1
	Nasopharynx	2	4.4
	Base of tongue	2	4.4
Histopathological differentiation	Well differentiated	22	48.9
	Moderately differentiated	14	31.1
	Poorly differentiated	9	20
Total		45	100

Table 3. Distribution of Patients According to Disease Stage and Treatment

Variable		Frequency (n)	Percentage (%)
AJCC stage	Stage III	14	31.1
	Stage IVA	28	62.2
	Stage IVB	3	6.7
Treatment modality	Surgery + chemoradiotherapy	28	62.2
	Chemoradiotherapy alone	17	37.8
Total		45	100

Table 4. Association Between Age Group and Three-Year Survival

Age group	Alive, n (%)	Died, n (%)	Total, n (%)	p-value
Below 60 years	18 (69.23)	8 (30.77)	26 (100.0)	0.031
Above 60 years	7 (36.84)	12 (63.16)	19 (100.0)	
Total	25 (55.56)	20 (44.44)	45 (100.0)	

Table 5. Comparison of Three-Year Survival According to Clinical Factors and Treatment

Variable	Category	Alive, n (%)	Died, n (%)	p-value
Number of addictions	**1**	15 (68.18)	7 (31.82)	0.076
	2	9 (52.94)	8 (47.06)	
	3	1 (16.67)	5 (83.33)	
Disease stage	**Stage III**	10 (71.43)	4 (28.57)	0.13
	Stage IVA	14 (51.85)	13 (48.15)	
	Stage IVB	0 (0.00)	3 (100.00)	

Figure 1. Distribution of Anatomical Sites and Histopathological Differentiation

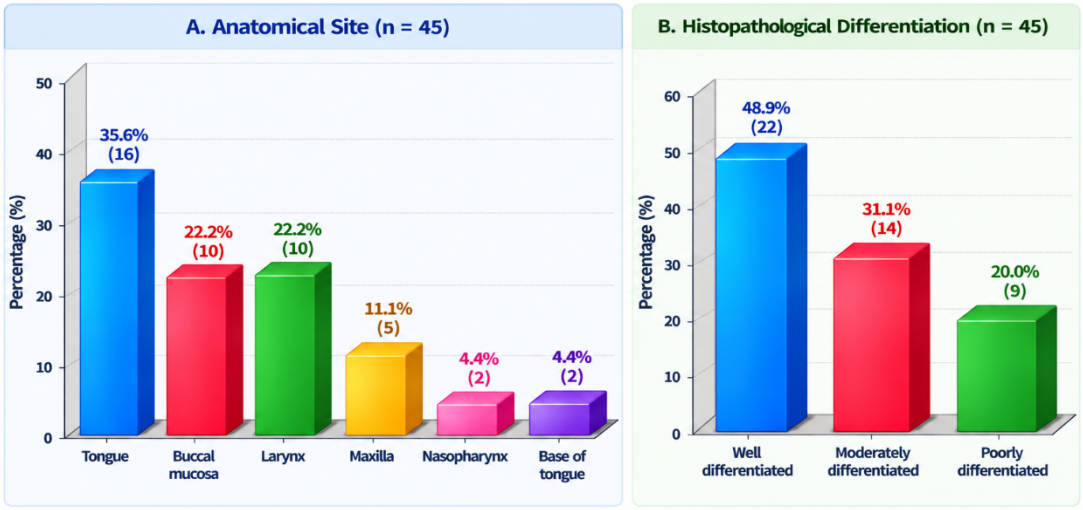
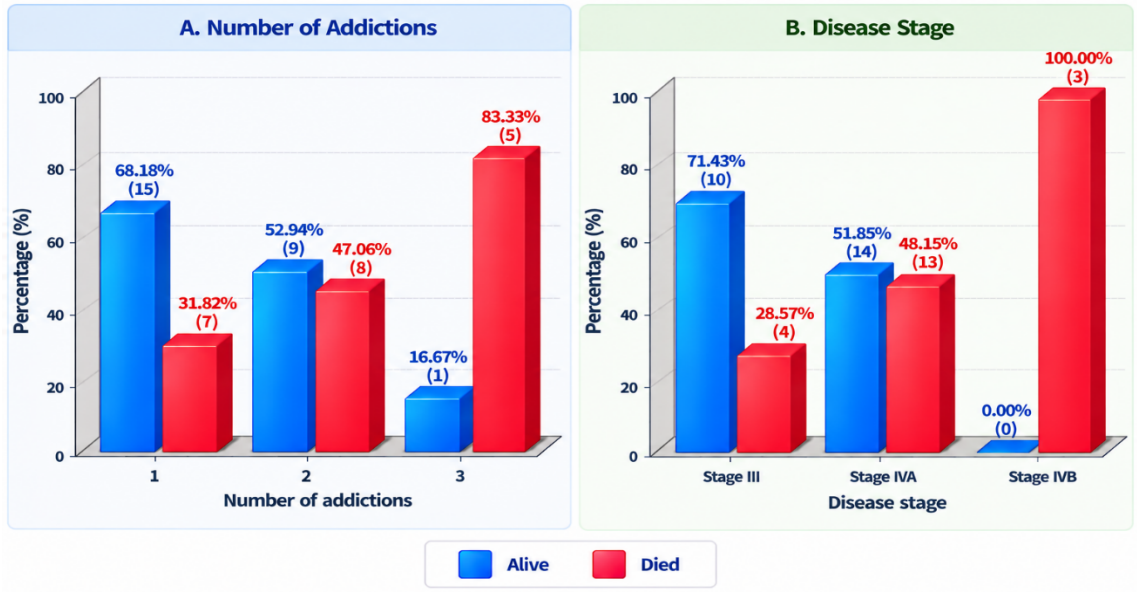


Figure 2. Survival Status by Number of Addictions and Disease stage



A total of 45 patients with advanced head and neck squamous cell carcinoma were included in the study. Among them, 35 (77.8%) were males and 10 (22.2%) were females, indicating a marked male predominance. Regarding age distribution, 26 patients (57.8%) were below 60 years, whereas 19 (42.2%) were above 60 years. This research work finds the disease affected both younger and older adults, with a greater proportion of patients belonging to the below-60-year age group. The predominance of males in the study population may reflect differences in exposure to behavioural risk factors and other demographic characteristics. However, these factors cannot be established as independent causes from the present descriptive data alone.

The anatomical distribution of tumours showed that the tongue was the most frequently affected site, accounting for 16 patients (35.6%). Buccal mucosa and laryngeal involvement were reported in 10 patients each (22.2%), followed by the maxilla in 5 patients (11.1%). Nasopharyngeal and base-of-tongue lesions were observed in 2 patients each (4.4%). Histopathological examination revealed that 22 patients (48.9%) had well-differentiated tumours, while 14 (31.1%) had moderately differentiated and 9 (20.0%) had poorly differentiated tumours. Overall, the findings demonstrate that the tongue was the predominant anatomical site and well-differentiated carcinoma was the most frequently reported histopathological category in this study population.

Regarding disease stage, 14 patients (31.1%) presented with Stage III disease, 28 (62.2%)

with Stage IVA, and 3 (6.7%) with Stage IVB. Thus, the majority of patients had Stage IVA disease, indicating that advanced-stage presentation was common in this cohort. In terms of treatment, 28 patients (62.2%) received surgery combined with chemoradiotherapy, whereas 17 (37.8%) received chemoradiotherapy alone. However, the treatment distribution alone does not establish the relative effectiveness of either approach, as treatment selection may have depended on tumour location, disease extent, operability, and the patient's clinical condition.

The relationship between age and survival demonstrated a noticeable difference between the two age groups. Among the 26 patients below 60 years, 18 (69.23%) were alive at the reported follow-up, while 8 (30.77%) had died. In comparison, among the 19 patients above 60 years, 7 (36.84%) were alive and 12 (63.16%) had died. Overall, 25 of the 45 patients (55.56%) were alive, whereas 20 (44.44%) had died. The reported p-value was 0.031, suggesting a statistically significant association between age group and survival at the conventional 5% significance level. Patients below 60 years had a higher observed survival proportion than older patients. Nevertheless, additional analysis would be necessary to determine whether age remained independently associated with survival after adjustment for disease stage, treatment, comorbidities, and other potential confounding factors.

The analysis of survival according to the number of addictions showed that 15 of 22 patients (68.18%) with one reported addiction were alive, compared with 9 of 17 (52.94%) with two addictions and 1 of 6 (16.67%) with three addictions. Although survival appeared to decrease as the number of addictions increased, the reported p-value of 0.076 did not demonstrate a statistically significant association. With respect to disease stage, 10 of 14 patients (71.43%) with Stage III disease were alive, compared with 14 of 27 (51.85%) with Stage IVA disease and none of the 3 patients with Stage IVB disease. The reported p-value was 0.130, indicating that the observed differences were not statistically significant. In the treatment comparison, 23 of 28 patients (82.14%) receiving surgery combined with chemoradiotherapy were alive, compared with 2 of 17 patients (11.76%) receiving chemoradiotherapy alone. The reported p-value was less than 0.0001, indicating a statistically significant difference in observed survival between the treatment groups. However, because treatment was not randomly assigned and the sample was small, this difference must be interpreted cautiously. Differences in disease severity, operability, patient selection, and other clinical characteristics may have influenced the results.

The study of 45 patients demonstrated a male predominance, a higher representation of patients below 60 years, and a greater frequency of tongue carcinoma and well-differentiated tumours. Most patients presented with Stage IVA disease, and combined surgery and chemoradiotherapy was the most frequently reported treatment approach. Patients below 60 years showed significantly higher observed survival than older patients, while the number of addictions and disease stage demonstrated nonsignificant trends. A significant difference in observed survival was reported between the two treatment groups, favouring combined treatment.

Discussion

The present study included 45 patients, of whom 35 (77.8%) were male and 10 (22.2%) were female. This male predominance is consistent with the findings of Sathishkumar et al., who analysed oral cancer survival across 10 Indian population-based cancer registries and reported that 73.8% of their study population were male [8]. The similarity suggests that men constitute a substantial proportion of patients with oral cancer in Indian populations, potentially reflecting differences in tobacco consumption, alcohol use, occupational exposures, and other behavioural factors. However, the present study did not establish the independent contribution of these exposures to the observed gender distribution.

Regarding age, 26 patients (57.8%) were below 60 years, while 19 (42.2%) were above 60 years. Although the proportion of younger patients was

higher in our cohort, a hospital-based study from Tata Memorial Hospital, Mumbai, demonstrated that age above 60 years was associated with a higher risk of death among patients with oral cancer (HR 1.37, 95% CI 1.01–1.85) [11]. Similarly, the large Indian registry analysis by Sathishkumar et al. reported a progressive decline in survival with increasing age [8]. These findings highlight the importance of considering age when evaluating survival outcomes, although differences in study populations and follow-up methods may influence the observed results.

In the present study, the tongue was the most frequently affected anatomical site, accounting for 16 patients (35.6%), followed by the buccal mucosa and larynx, each with 10 patients (22.2%). The maxilla was involved in 5 patients (11.1%), while nasopharyngeal and base-of-tongue lesions accounted for 2 patients each (4.4%). The distribution demonstrates the predominance of oral cavity lesions in this cohort, although laryngeal malignancies also represented a considerable proportion. A hospital-based study from North India reported variation in the distribution of head and neck cancer subsites, reflecting differences in regional risk exposures and referral patterns [12]. Similarly, the multicentre Indian registry analysis demonstrated substantial variation in oral cancer outcomes across geographical regions [8].

Histopathologically, well-differentiated tumours were most common, affecting 22 patients (48.9%), followed by moderately differentiated tumours in 14 patients (31.1%) and poorly differentiated tumours in 9 patients (20.0%). Nearly half of the tumours retained well-differentiated histological characteristics. However, differentiation alone cannot adequately predict survival without considering clinical stage, nodal involvement, treatment completion, and other prognostic factors. In a large hospital-based oral cancer study, poorly differentiated tumours were associated with a higher risk of death, supporting the importance of histopathological grading in prognostic assessment [11].

The majority of patients in the present study had advanced disease at presentation. Stage IVA accounted for 28 patients (62.2%), followed by Stage III in 14 patients (31.1%) and Stage IVB in 3 patients (6.7%). This distribution indicates that most patients were diagnosed after the disease had progressed beyond an early stage. Similar observations were reported by a comprehensive cancer care centre in North India, where a substantial proportion of patients presented with advanced head and neck malignancies [12]. Late presentation may be associated with delayed recognition of symptoms, limited access to diagnostic facilities, and delays in referral, although these factors were not directly assessed in the present study.

Regarding treatment, 28 patients (62.2%) underwent surgery combined with chemoradiotherapy, whereas 17 (37.8%) received chemoradiotherapy alone. This pattern reflects the use of different treatment approaches according to clinical circumstances. A retrospective cohort study of patients with head and neck squamous cell carcinoma from Northeast India also documented the use of multimodality treatment and reported that clinical and treatment-related factors influenced survival outcomes [12]. Nevertheless, the choice of treatment in the present study cannot be evaluated independently of tumour operability, disease extent, patient fitness, and treatment intent.

A clear difference in observed survival was noted between the age groups. Among patients below 60 years, 18 of 26 (69.23%) were alive at the reported follow-up, compared with 7 of 19 (36.84%) patients above 60 years. Conversely, mortality was higher among older patients, with 12 (63.16%) deaths compared with 8 (30.77%) deaths among younger patients. The reported p-value of 0.031 indicated a statistically significant association between age group and survival. These findings are consistent with the Indian population-based analysis by Sathishkumar et al., which demonstrated declining oral cancer survival with increasing age [8]. Similarly, the Tata Memorial Hospital study identified age above 60 years as a significant predictor of mortality [11]. The

poorer outcomes among older patients may reflect differences in comorbidities, physiological reserve, treatment tolerance, and delays in diagnosis. However, these potential explanations require further investigation, as the present study did not assess their independent effects.

The analysis of addiction history revealed a decreasing trend in survival with an increasing number of reported addictions. Among patients with one addiction, 15 of 22 (68.18%) were alive, whereas 9 of 17 (52.94%) patients with two addictions survived. Among the six patients reporting three addictions, only one (16.67%) was alive at the reported follow-up, while five (83.33%) had died. Despite this apparent trend, the association was not statistically significant ($p = 0.076$). These findings suggest that multiple addiction exposures may be associated with poorer outcomes, but the available evidence is insufficient to establish a definitive relationship in this cohort. The biological and behavioural relevance of tobacco and alcohol exposure in head and neck cancer is well recognised, although their individual and combined effects on survival depend on several clinical and treatment-related factors. The small number of patients in the multiple-addiction category also limits the statistical power of the present analysis.

Survival proportions declined with increasing disease stage in the present study. Among patients with Stage III disease, 10 of 14 (71.43%) were alive, compared with 14 of 27 (51.85%) patients with Stage IVA disease. None of the three patients with Stage IVB disease survived to the reported follow-up. However, the reported association was not statistically significant ($p = 0.130$). The Stage IVB group contained only three patients. The overall pattern is consistent with findings from Indian population-based studies demonstrating poorer survival with more extensive disease at diagnosis [8]. A hospital-based study from Tata Memorial Hospital likewise reported a higher risk of death among patients with Stage IV oral cancer [11]. These comparisons support the clinical importance of early diagnosis and accurate staging, while recognising that the present study's small sample size limits the precision of stage-specific survival estimates.

A substantial difference in observed survival was found between the treatment groups. Among the 28 patients who received surgery combined with chemoradiotherapy, 23 (82.14%) were alive and 5 (17.86%) had died. In contrast, among the 17 patients treated with chemoradiotherapy alone, only 2 (11.76%) were alive, while 15 (88.24%) had died. The reported p-value was less than 0.0001, indicating a statistically significant difference between the groups. Similar research from Northeast India has highlighted the importance of treatment selection and multimodality management in head and neck squamous cell carcinoma outcomes [12]. A hospital-based study from Mumbai also reported poorer outcomes among patients receiving chemotherapy alone compared with those receiving more comprehensive treatment [11]. Nevertheless, the observed difference in the present study not interpreted as proof that surgery combined with chemoradiotherapy is universally superior. Patients selected for different treatments may have differed in tumour resectability, disease severity, performance status, and other prognostic characteristics. These factors should be considered before drawing conclusions regarding treatment effectiveness.

Overall, the findings indicate that advanced head and neck squamous cell carcinoma was associated with considerable mortality in this cohort, with 20 of 45 patients (44.44%) recorded as deceased at the reported follow-up. Older age was significantly associated with poorer survival, while increasing numbers of addictions and advancing disease stage showed unfavourable but statistically nonsignificant trends. Treatment modality was also strongly associated with observed survival, although potential confounding factors limit causal interpretation. These findings are broadly consistent with larger Indian studies emphasising the importance of age, disease extent, histopathological characteristics, and appropriate treatment in determining outcomes. The results support the importance of early detection, accurate staging, appropriate

multidisciplinary treatment, and regular follow-up. Larger prospective studies with detailed clinical information and formal time-to-event analyses are needed to establish independent prognostic factors and provide more reliable estimates of three-year survival.

Conclusion

This study highlights the clinical and prognostic characteristics of patients with advanced head and neck squamous cell carcinoma in Western Maharashtra. The findings demonstrate a predominance of male patients, with the tongue being the most frequently affected anatomical site and advanced-stage disease commonly observed. Histopathological examination revealed well-differentiated carcinoma as the most frequent tumour category. Survival outcomes appeared to be influenced by patient age, with older individuals experiencing poorer survival than younger patients. Treatment modality also showed a significant association with survival, suggesting the potential importance of an appropriate multidisciplinary treatment approach. The findings emphasize the need for early diagnosis, timely intervention, effective treatment planning, and regular follow-up to improve patient outcomes. However, the interpretation of these results is limited by the relatively small sample size, observational study design, and inconsistencies in certain recorded data. Further prospective studies involving larger patient populations and comprehensive follow-up are necessary to validate these findings and establish more reliable prognostic indicators for advanced HNSCC.

Declarations

Ethical Approval and Consent to Participate:

This study was reviewed and approved by the Institutional Ethics Committee of Bharati Vidyapeeth (Deemed to be University) Medical College and Hospital, Pune. Because of the retrospective nature of the study using anonymized secondary medical records, the requirement for individual informed consent was waived by the ethics committee.

Availability of Data and Materials:

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request, subject to institutional data governance and privacy policies.

Competing Interests / Conflicts of Interest:

The authors declare that they have no competing interests, financial or non-financial, directly or indirectly related to the work submitted for publication.

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Use of Artificial Intelligence (AI) Declaration:

During the preparation of this work, the authors utilized AI-assisted language models solely to assist with grammatical review, reference verification, and manuscript styling. The authors reviewed and edited the output and take full responsibility for the contents of the published article.

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