




Original Article

Assessment of Oral Mucositis and Associated Predictive Factors During Chemoradiotherapy for Head and Neck Cancer

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ABSTRACT

Background: Oral mucositis is one of the most frequent and debilitating complications encountered during chemoradiotherapy for head and neck cancer. It can cause pain, difficulty in swallowing, nutritional compromise, and interruption of cancer treatment. Identification of predictive factors may facilitate early intervention and improve patient outcomes.

Aim: To assess the occurrence of oral mucositis and identify factors associated with its severity among patients undergoing concurrent chemoradiotherapy for head and neck cancer.

Materials and Methods: A prospective observational study was conducted among 52 patients with histopathologically confirmed head and neck cancer receiving concurrent chemoradiotherapy at Government Medical College, Miraj. Baseline demographic, clinical, and treatment-related data were collected using a structured proforma. Oral examinations were performed before treatment and subsequently at weekly intervals throughout therapy. Oral mucositis was assessed using the World Health Organisation (WHO) Oral Toxicity Scale. Associations between oral mucositis severity and potential predictive factors were analysed using appropriate statistical tests.

Results: Among the 52 participants, oral mucositis developed in 46 patients (88.5%). Grade 2 mucositis was the most common presentation, while severe mucositis (Grade 3 and Grade 4) was observed in 19 patients (36.5%). The mean onset of mucositis was 2.6 ± 0.8 weeks after initiation of treatment. Significant associations were observed between severe mucositis and tobacco use ($p=0.041$), poor oral hygiene ($p=0.025$), undernutrition ($p=0.013$), and treatment interruption ($p=0.008$). Age, gender, clinical stage, alcohol use, and radiation dose did not show statistically significant associations with severe mucositis.

Conclusion: Oral mucositis was highly prevalent among patients undergoing chemoradiotherapy for head and neck cancer. Tobacco use, poor oral hygiene, and undernutrition were important predictors of severe mucosal toxicity. Early risk assessment, preventive oral care, and nutritional interventions may help reduce the severity of oral mucositis and improve treatment adherence.

Keywords: Oral mucositis; Head and neck cancer; Chemoradiotherapy; Oral hygiene; Nutritional status; Predictive factors.

INTRODUCTION

Head and neck cancers are among the most common malignancies worldwide and represent a significant cause of morbidity and mortality. Radiotherapy, either alone or in combination with chemotherapy, remains a cornerstone in the treatment of these cancers. Concurrent chemoradiotherapy is frequently employed because it improves locoregional control and overall survival. However, despite its therapeutic benefits, this treatment modality is associated with several acute and chronic toxicities that adversely affect patients' quality of life. Among these complications, oral mucositis is one of the most common and debilitating adverse effects encountered during treatment.[1,2]

Oral mucositis is an inflammatory condition characterised by erythema, oedema, ulceration, and pain involving the oral mucosa. It develops as a consequence of direct cytotoxic effects of radiation and chemotherapy on the rapidly dividing basal epithelial cells of the oral mucosa. The condition generally appears during the second or third week of treatment and may progressively worsen with increasing cumulative radiation dose.[3] Severe mucositis can result in intense pain, difficulty in swallowing, impaired speech, nutritional deficiencies, dehydration, and increased susceptibility to local and systemic infections.[4]

The occurrence of oral mucositis is particularly high among patients receiving chemoradiotherapy for head and neck cancer. Previous studies have reported that the majority of such patients develop some degree of mucosal injury during treatment, with a considerable proportion experiencing severe forms requiring supportive interventions.[5] The condition may necessitate treatment interruptions, dose modifications, or hospitalisation, thereby compromising treatment outcomes and increasing healthcare costs.[6]

The severity of oral mucositis is influenced by multiple factors. Patient-related factors such as age, nutritional status, oral hygiene, tobacco use, alcohol consumption, systemic illnesses, and salivary gland function may contribute to susceptibility. Treatment-related factors, including total radiation dose, radiation field size, fractionation schedule, chemotherapy regimen, and treatment duration, also play important roles in the development and progression of mucositis.[7] Identification of these predictive factors is essential for early risk stratification and implementation of preventive measures.

Accurate assessment of oral mucositis using standardised grading systems is important for monitoring disease progression and evaluating treatment-related toxicity. Understanding the factors associated with its occurrence may help clinicians develop targeted supportive care strategies, minimise treatment interruptions, and improve patient outcomes.[8] Therefore, the present study was undertaken to assess oral mucositis and its associated predictive factors among patients undergoing chemoradiotherapy for head and neck cancer.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study was conducted in the Department of Radiation Oncology at Government Medical College, Miraj. The study was conducted over 12 months following approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrolment.

Study Population

Patients diagnosed with head and neck cancer and planned to undergo concurrent chemoradiotherapy were screened for eligibility. Eligible patients were recruited consecutively during the study period.

Inclusion Criteria

- Patients aged 18 years and above.
- Histopathologically confirmed head and neck cancer.
- Patients scheduled to receive external beam radiotherapy with concurrent chemotherapy.
- Patients willing to participate and provide written informed consent.

Exclusion Criteria

- Patients who had received previous radiotherapy to the head and neck region.
- Patients with recurrent head and neck cancer.
- Patients presenting with pre-existing oral ulcerative lesions unrelated to cancer therapy.
- Patients with severe systemic illness that could interfere with study participation.
- Patients unwilling to provide consent or comply with follow-up examinations.

Data Collection

Baseline demographic and clinical information, including age, sex, tobacco consumption, alcohol use, comorbidities, tumour site, tumour stage, and treatment details, was recorded using a structured proforma. Information regarding radiation dose, fractionation schedule, chemotherapy regimen, and treatment duration was obtained from medical records.

Prior to initiation of chemoradiotherapy, all participants underwent a comprehensive oral examination. Oral hygiene status, periodontal condition, presence of sharp teeth, dental prostheses, and existing oral lesions were documented. Necessary oral health instructions were provided before the commencement of treatment.

Assessment of Oral Mucositis

Participants were evaluated weekly from the initiation of chemoradiotherapy until completion of treatment. Oral mucositis was assessed clinically using the World Health Organisation (WHO) Oral Toxicity Scale.

The grading criteria were as follows:

- Grade 0: No mucositis.
- Grade 1: Soreness and/or erythema.
- Grade 2: Erythema and ulcers, patient able to consume solid diet.
- Grade 3: Ulcers requiring a liquid diet only.
- Grade 4: Severe mucositis requiring enteral or parenteral nutritional support.

The highest grade of mucositis observed during the treatment period was recorded for analysis.

Assessment of Predictive Factors

Potential predictive factors associated with oral mucositis were evaluated. Patient-related factors included age, gender, tobacco use, alcohol consumption, oral hygiene status, nutritional status, and presence of systemic diseases. Treatment-related factors included total radiation dose, radiation field, cumulative chemotherapy dose, treatment duration, and treatment interruptions.

Outcome Measures

The primary outcome measure was the incidence and severity of oral mucositis during chemoradiotherapy. The secondary outcome measures were the time to onset of oral mucositis, the peak mucositis grade, and the associations between oral mucositis severity and patient-related and treatment-related factors.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) software version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean \pm standard deviation, while categorical variables were presented as frequencies and percentages. The association between categorical variables and mucositis severity was analysed using the Chi-square test. An independent-samples t-test was used to compare continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 52 patients with head and neck cancer undergoing concurrent chemoradiotherapy were included in the study. The mean age of the study participants was 54.8 ± 10.6 years. Most patients were males, and the most common tumour site was the oral cavity, followed by the oropharynx. Oral mucositis developed in 46 patients (88.5%) during the course of treatment. Severe oral mucositis, defined as WHO Grade 3 or Grade 4, was observed in 19 patients (36.5%). The mean time of onset of mucositis was 2.6 ± 0.8 weeks, and the mean peak grade of mucositis was 2.3 ± 0.9 .

Table 1: Baseline demographic and clinical characteristics of study participants

Variable	Category	Frequency	Percentage
Age group	≤ 50 years	18	34.6
	> 50 years	34	65.4
Gender	Male	39	75.0
	Female	13	25.0
Tobacco use	Present	35	67.3
	Absent	17	32.7
Alcohol use	Present	24	46.2
	Absent	28	53.8
Oral hygiene status	Good/Fair	22	42.3
	Poor	30	57.7
Nutritional status	Normal	31	59.6
	Undernourished	21	40.4
Tumour site	Oral cavity	24	46.2
	Oropharynx	14	26.9
	Larynx/Hypopharynx	10	19.2
	Others	4	7.7
Clinical stage	Stage II	8	15.4
	Stage III	18	34.6
	Stage IV	26	50.0

Most patients were above 50 years of age and males. Tobacco use was common in the study group. More than half of the patients had poor oral hygiene, and 40.4% were undernourished at baseline. Advanced-stage disease was seen in a majority of patients as seen in Table 1.

Table 2: Incidence, onset and severity of oral mucositis during chemoradiotherapy

Oral mucositis variable	Frequency / Mean value
Patients developing oral mucositis	46 (88.5%)
Patients without oral mucositis	6 (11.5%)
Mean time of onset of mucositis	2.6 ± 0.8 weeks
Mean peak grade of mucositis	2.3 ± 0.9
WHO Grade 0	6 (11.5%)
WHO Grade 1	9 (17.3%)
WHO Grade 2	18 (34.6%)
WHO Grade 3	16 (30.8%)
WHO Grade 4	3 (5.8%)
Severe mucositis, Grade 3 and 4	19 (36.5%)
Treatment interruption due to mucositis	7 (13.5%)
Requirement of nutritional support	11 (21.2%)
Requirement of opioid analgesics	17 (32.7%)

Oral mucositis was observed in a high proportion of patients receiving chemoradiotherapy. Grade 2 mucositis was the most frequent finding. More than one-third of patients developed severe mucositis, and a small proportion required treatment interruption because of mucositis-related complications as seen in Table 2.

Table 3: Association of selected predictive factors with severe oral mucositis

Predictive factor	Category	Severe mucositis present n (%)	Severe mucositis absent n (%)	p-value
Age group	≤50 years	5 (27.8)	13 (72.2)	0.346
	>50 years	14 (41.2)	20 (58.8)	
Gender	Male	15 (38.5)	24 (61.5)	0.681
	Female	4 (30.8)	9 (69.2)	
Tobacco use	Present	16 (45.7)	19 (54.3)	0.041*
	Absent	3 (17.6)	14 (82.4)	
Alcohol use	Present	11 (45.8)	13 (54.2)	0.182
	Absent	8 (28.6)	20 (71.4)	
Oral hygiene status	Poor	15 (50.0)	15 (50.0)	0.025*
	Good/Fair	4 (18.2)	18 (81.8)	
Nutritional status	Undernourished	12 (57.1)	9 (42.9)	0.013*
	Normal	7 (22.6)	24 (77.4)	
Clinical stage	Stage III/IV	18 (40.9)	26 (59.1)	0.224
	Stage II	1 (12.5)	7 (87.5)	
Radiation dose	≥60 Gy	17 (42.5)	23 (57.5)	0.118
	<60 Gy	2 (16.7)	10 (83.3)	
Treatment interruption	Present	6 (85.7)	1 (14.3)	0.008*
	Absent	13 (28.9)	32 (71.1)	

* = Statistically significant.

Severe oral mucositis was significantly associated with tobacco use, poor oral hygiene, undernutrition and treatment interruption. Age, gender, alcohol use, clinical stage and radiation dose showed higher proportions of severe mucositis in some categories, but these associations were not statistically significant as seen in Table 3.

Overall, the results showed that oral mucositis was a frequent complication among patients undergoing chemoradiotherapy for head and neck cancer. The majority of patients developed mucositis by the second or third week of treatment. Severe mucositis was more commonly observed among patients with tobacco use, poor oral hygiene and undernutrition. These findings suggest that baseline oral health and nutritional assessment may help in identifying patients at higher risk for severe mucosal toxicity during chemoradiotherapy.

DISCUSSION

The present study assessed the occurrence of oral mucositis and its associated predictive factors among patients undergoing concurrent chemoradiotherapy for head and neck cancer. Oral mucositis developed in 88.5% of the

participants, indicating that it remains one of the most common adverse effects associated with cancer treatment in this group of patients. Similar high incidences have been reported in previous studies, where mucositis was identified as a major dose-limiting toxicity during radiotherapy and chemoradiotherapy for head and neck malignancies.[9,10] In the present study, the mean onset of mucositis was 2.6 weeks after initiation of treatment. This finding is consistent with the biological pattern of radiation-induced mucosal injury, which typically becomes clinically evident during the second or third week of therapy. Sroussi et al. reported that mucosal damage progresses with cumulative radiation exposure and often intensifies during the later phases of treatment.[11]

Regarding severity, Grade 2 mucositis was the most common presentation, and 36.5% of patients developed severe mucositis (Grades 3 or 4). Similar observations have been reported by Trotti et al., who noted that a substantial proportion of patients receiving combined treatment develop clinically significant mucosal toxicity requiring supportive care interventions.[9] Severe mucositis is particularly important because it contributes to pain, difficulty swallowing, nutritional compromise, and deterioration in quality of life. One of the important findings of the present study was the significant association between tobacco use and severe oral mucositis. Patients with a history of tobacco consumption experienced higher rates of severe mucosal injury than non-users. Tobacco exposure may alter mucosal integrity, impair tissue repair mechanisms and increase local inflammatory responses, thereby enhancing susceptibility to treatment-related toxicity.[12]

Poor oral hygiene was another significant predictor of severe mucositis. Patients with poor oral hygiene demonstrated a greater frequency of Grade 3 and Grade 4 lesions. This finding supports the importance of maintaining optimal oral health before and during cancer treatment. Cheng et al. emphasised that oral microbial burden and local irritants can aggravate mucosal inflammation and worsen treatment-related complications.[13] Undernutrition was also significantly associated with severe mucositis. Malnourished patients may have reduced immune competence and impaired regenerative capacity, making them more vulnerable to epithelial damage and delayed healing. Similar observations have been reported in studies evaluating the nutritional status of patients receiving radiotherapy for head and neck cancer.[14] Although higher proportions of severe mucositis were observed among older patients, individuals with advanced-stage disease and those receiving higher radiation doses, these associations were not statistically significant in the present study. Comparable findings have been reported by several investigators, suggesting that patient-related factors and oral health status may have a stronger influence on mucositis severity than demographic variables alone.[11,15] Treatment interruption was significantly associated with severe oral mucositis. Patients who developed Grade 3 or Grade 4 mucositis were more likely to experience interruptions in therapy. This observation is clinically relevant because treatment breaks may compromise tumour control and negatively affect treatment outcomes.[16]

The findings of the present study highlight the importance of early oral assessment, nutritional evaluation and tobacco cessation counselling before initiation of chemoradiotherapy. Identification of high-risk patients and implementation of preventive oral care measures may help reduce the severity of mucositis and improve treatment compliance. Overall, oral mucositis remains a significant challenge during chemoradiotherapy, and targeted supportive care strategies are essential for minimizing treatment-related morbidity.

CONCLUSION

Oral mucositis was a common complication among patients undergoing concurrent chemoradiotherapy for head and neck cancer, affecting the majority of study participants. Severe mucositis was observed in more than one-third of patients and was significantly associated with tobacco use, poor oral hygiene, undernutrition, and treatment interruption. Early identification of these risk factors may help in recognizing patients at greater risk of developing severe mucosal toxicity. Regular oral assessment, maintenance of oral hygiene, nutritional support, and tobacco cessation counselling should be incorporated into routine cancer care. Implementation of preventive and supportive measures may reduce treatment-related morbidity and improve treatment compliance and patient outcomes.

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