Feller *et al. BMC Cancer* (2025) 25:1917
https://doi.org/10.1186/s12885-025-15238-x

BMC Cancer

RESEARCH

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Demographic, clinicopathological, and treatment of oral squamous cell carcinoma patients at a Johannesburg Academic Hospital, South Africa: a 5-year retrospective observational study

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Abstract

Background Oral squamous cell carcinoma (OSCC) comprises most oral malignancies worldwide and is closely associated with modifiable risk factors such as tobacco and alcohol use. Late-stage presentation is common and contributes significantly to poor treatment outcomes. This study aimed to delineate demographic, clinicopathological features, and radiation-induced toxicities among OSCC patients treated at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) between 2014 and 2019.

Methods A retrospective, cross-sectional review of 119 histologically confirmed OSCC cases was conducted. Data included patient demographics, tumour characteristics, alcohol consumption and smoking, treatment modality, and acute radiation-related toxicities. Descriptive statistics and inferential analyses were performed using SPSS version 24.0. Associations between categorical variables were tested using chi-square and Fisher's exact tests; p-values < 0.05 were considered statistically significant.

Results Among 119 patients, 71% were male ($n = 84$) with a mean age of 59.6 years. Black African patients constituted 67% of the cohort. The tongue (30%) and floor of mouth (25%), others were the most common tumour subsites. Most tumours were moderately differentiated (53%), and over 85% presented with stage III or IV disease. Tobacco use was reported in 94% of males and 66% of females, with alcohol use in 73% and 49%, respectively. A significant association was found between combined substance use and higher-grade tumours ($p = 0.04$). All patients experienced at least one radiation-induced toxicity, with mucositis (61%) and dermatitis (62%) being most frequent. Toxicities were significantly more prevalent in patients receiving concurrent chemoradiotherapy ($p < 0.01$).

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Conclusion The study highlights the predominance of advanced-stage OSCC in older males with high-risk habits and underscores the urgent need for early detection strategies and public health interventions. High toxicity rates necessitate enhanced patient education and supportive care during treatment.

Keywords Carcinoma, Squamous cell, Head and neck neoplasms, Radiotherapy, Epidemiology, Risk factors, South Africa

Introduction

Oral squamous cell carcinoma (OSCC) represents over 90% of malignant oral cavity tumours and is one of the most prevalent cancers globally [1–4], especially in low- and middle-income countries (LMICs) where tobacco and alcohol consumption are widespread. Globally, over 377,000 new oral cancer cases and approximately 177,000 related deaths were reported in 2020, with considerable variation in incidence and outcomes across regions [2]. South Africa faces a significant burden of oral cancer due to prevalent risk factors, delayed diagnosis, and unequal healthcare access [5].

Established risk factors for OSCC include tobacco smoking, alcohol abuse, betel nut chewing, poor oral hygiene, and nutritional deficiencies [6]. The synergistic effect of tobacco and alcohol significantly increases the risk of OSCC. Betel nut chewing alone or in combination with tobacco, is a well-documented carcinogenic habit, particularly prevalent across many Asian and Pacific populations, and has been shown to substantially increase oral cancer risk [7–9]. Commonly affected sites include the tongue, floor of mouth, and buccal mucosa, often presenting as persistent ulcers or masses and typically diagnosed at advanced stages [6, 10, 11].

At CMJAH, a major public tertiary hospital, many oncology patients present with inoperable, late-stage disease. In these settings, radiotherapy, with or without concurrent chemotherapy, serves as the predominantly employed treatment modality [12]. However, this treatment modality is associated with substantial acute and chronic toxicities, impacting treatment adherence and patient quality of life [13].

Despite the increasing incidence, there remains a paucity of local data on the demographic distribution, tumour characteristics, treatment strategies, and radiation-related complications of OSCC. This study aimed to characterize the demographic and clinicopathological features of oral SSC patients treated with radiotherapy at CMJAH and to describe the spectrum of radiation-induced toxicities.

Materials and methods

Study design and setting

A retrospective, cross-sectional study was conducted at CMJAH, at the Division of Radiation Oncology, tertiary academic hospital in Gauteng Province, South Africa. Patients included were treated from 1 January 2014 to 31 December 2019 with histologically confirmed OSCC of the oral cavity (tongue, floor of mouth, buccal mucosa, hard palate, gingiva, alveolar ridge), were reviewed to characterize the demographic and clinical profiles of patients diagnosed with oral SCC).

Eligible cases included all patients with histopathologically confirmed primary squamous cell carcinoma (SCC) of the oral cavity and its subsites who underwent radiotherapy at CMJAH within the 6-year study window. Exclusion criteria comprised all non-oral head and neck cancers (e.g., oropharyngeal, nasopharyngeal, and salivary gland malignancies), and oral cavity malignancies of non-squamous histologies, such as adenocarcinoma, melanoma, lymphoma, and sarcoma.

Many of these patients are presented at a combined multidisciplinary meeting and are deemed inoperable by the surgeons primarily due to their advanced clinical stage. Consequently, they are offered either definitive radiotherapy or concurrent chemoradiotherapy as primary treatment option. Patients who are presented at an earlier stage may undergo surgical resection and be referred to our department for adjuvant radiotherapy, as appropriate.

Due to the advanced clinical stage of disease at presentation in many cases and lack of documentation from referring facilities, information regarding pre-existing potentially malignant oral disorders was inconsistently available and was thus excluded from the analysis.

Study duration

The study period was delimited to the years 2014–2019 to avoid the confounding effects of two major service disruptions: (1) the COVID-19 pandemic in 2020, which led to national lockdowns and severely restricted healthcare access; and (2) the CMJAH fire in 2021, which caused prolonged departmental closure and further reduced patient throughput. These events would have significantly impacted case volumes and treatment continuity.

Variables and data collection

Data was collected from medical records, radiotherapy planning systems, and treatment charts using a standardized data capture sheet. Variables captured included age, sex, ethnicity, tumour subsite, Tumor, Node, Metastasis (TNM) staging, histologic grade, tobacco and alcohol use, treatment intent (definitive/palliative), chemotherapy administration, and documented acute toxicities. For certain cases, the histopathological grade or full staging information was not specified in the available pathology reports or clinician notes, primarily due to incomplete referral information or biopsies that were insufficient for definitive grading. These instances were categorized as "Unknown" in the analysis to maintain the integrity of the dataset and are explicitly reported in Table 1. No data imputation was performed for these missing values. Information on alcohol and tobacco use was abstracted from patients' medical records and recorded as categorical (Yes/No) variables. Quantitative data such as pack-years or alcohol units were not uniformly available due to the retrospective nature of the study.

Radiotherapy was delivered via 2D external beam techniques using either Cobalt-60 or linear accelerator (LINAC) platforms.

Definitive treatment comprised 60–70 Gy over 6–7 weeks, while palliative regimens ranged from 20 to 30 Gy. Concurrent cisplatin was administered where indicated.

Table 1 Ethnicity in relation to age, gender, histopathological grade, and clinical stage for the entire study population

Characteristic	Black, *N*=80, 67%	White, *N*=26 22%	Other, *N*=13 11%	Total, *N*=119
Age (years)				
Mean	58.85	63.96	55.75	59.59
Median	60	63.5	55.5	60
Range	26 – 81	46 – 79	42 – 70	26-81
Standard deviation	9.9776	8.257	10.389	9.949
Males (years)				
Mean	58	63	54.5	58.70
Median	58	60.5	54.5	59
Standard deviation	9.18	8.18	11.004	9.349
Females (years)				
Mean	60.43	65.2	59.5	61.76
Median	61	66	59.5	62.5
Standard deviation	11.991	9.089	14.849	11.409
Gender; frequency, (%)				
Males	57, 71	16, 62	11, 85	84, 71
Females	23, 29	10, 38	2, 15	35, 29
Histopathological grading Frequency, (%)				
Well-differentiated	3, 4	0, 0	0, 0	3, 3
Moderately-differentiated	71, 88	21, 81	9, 69	85
Poorly-differentiated	6, 8	2, 8	2, 15	10, 8
Unknown (missing data)	0, 0	3, 11	2, 15	5, 4
AJCC Prognostic Stage Group Frequency, (%)				
I	0, 0	0, 0	0, 0	0, 0
II	5, 6	3, 12	0, 0	8, 7
III	7, 9	1, 4	1, 8	9, 8
IV	63, 79	18, 69	11, 84	92, 77
Unknown (missing data)	5, 6	4, 15	1, 8	10, 8

Toxicities such as mucositis, dermatitis, xerostomia, dysphagia, trismus, and salivary dysfunction were recorded and graded based on the Common Terminology Criteria for Adverse Events (CTCAE) version 5.0. Missing data was excluded from relevant analyses (See Fig. 1).

Ethical considerations

Ethical clearance was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg (Clearance Certificate No. M220869). Administrative authorization was granted by the Hospital Chief Executive Officer (CEO), CMJAH, the Gauteng Department of Health, and Head of Division of Radiation Oncology, CMJAH. This study was conducted in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki as revised in 2013 [14].

Statistical analysis

Continuous variables (e.g., age) were presented as means and standard deviations. Categorical variables (e.g., sex, tumor site, histological grade, clinical stage, treatment intent, and side effects) were summarized using frequencies and percentages. Descriptive and inferential statistical analyses on the observed variables were performed using IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp., Armonk, NY, USA). A p-value < 0.05 was considered statistically significant throughout, with a 95% confidence interval.

Results

Demographic and clinical characteristics

In a cohort of 119 patients diagnosed with primary OSCC, a notable male predominance was identified, in a male-to-female ratio of 2.4:1 (71% males [$n=84$] and 29% females [$n=35$]). The mean average at radiotherapy was 58.7 years for males (range: 32–86), and 61.8 years for females (range: 26–81) (Table 1). Most of the patients were of Black African ethnicity (67%), followed by White (22%) and Coloureds (as classified by Statistics South Africa (StatsSA) and Indians (11%).

The tongue (29%) and floor of mouth (25%) were the most affected subsites, followed by combined tongue and floor of mouth (16%), retromolar trigone (10%) and palate (5%), accounting for 85% of cases (Table 2). Among males, the tongue was the most frequent (36%), whereas in females the floor of the mouth predominated (28%). Histologically, moderately differentiated tumours comprised 85%, poorly differentiated 8%, and well differentiated 3%. Over 85% were presented with stage III-IV disease, likely reflecting referral bias because early-stage patients were often treated surgically without radiotherapy.

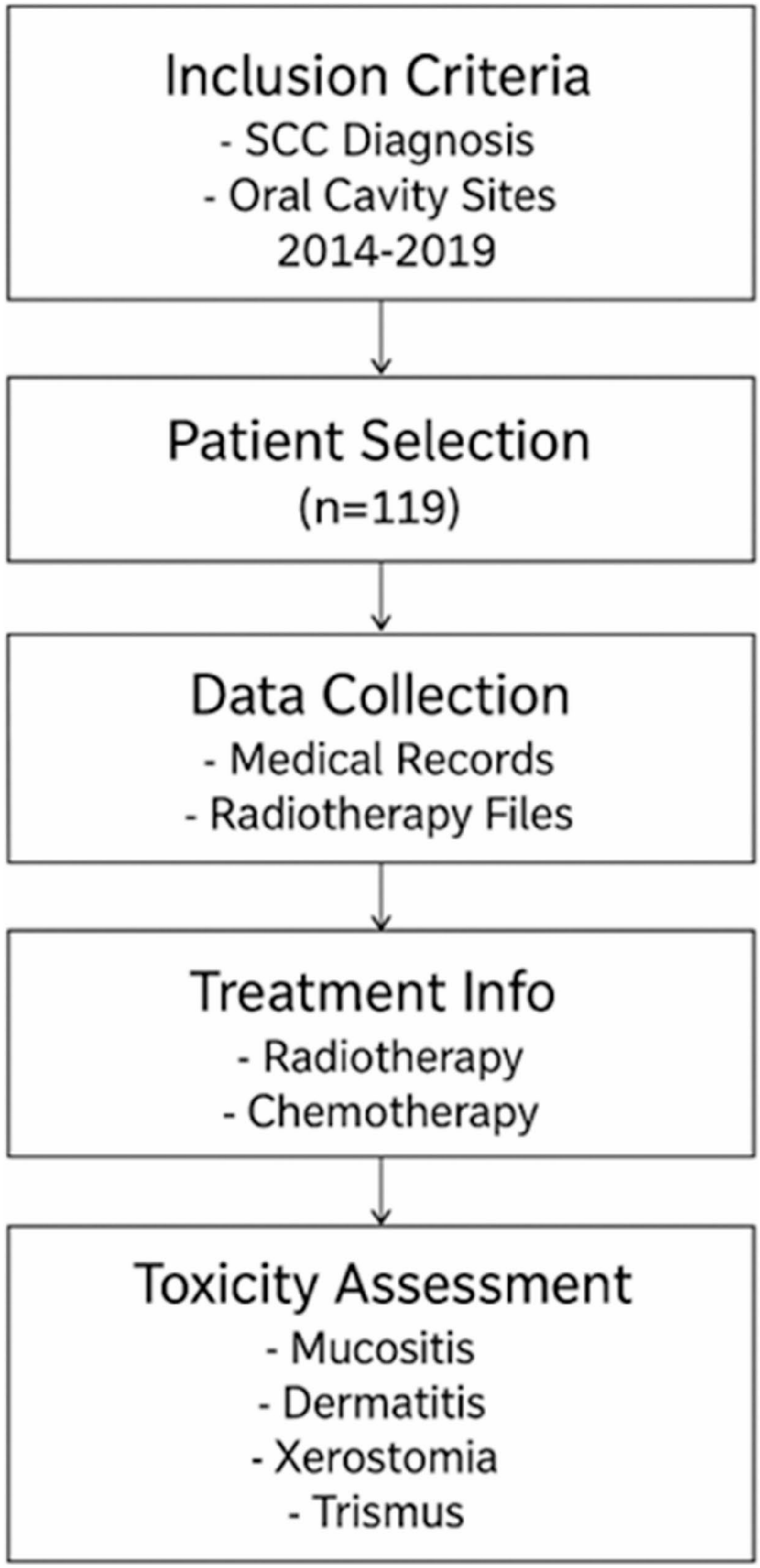

Fig. 1 Study Design and Workflow

Table 2 The age, ethnicity and gender of the 119 patients with oral SCC in relation to the oral mucosal subsite affected

Site	Age (years)		Number of patients affected $N = 119$; (%)	Ethnicity, $N = 119$			Gender, $N = 119$	
	Mean	Range		Black $n = 80$; %	White $n = 26$; %	Other $n = 13$; %	Male $n = 84$; %	Female $n = 35$; %
Tongue	61	43–79	35, 29	20, 25	13, 50	2, 15	30, 36	5, 14
Floor of the mouth	60	40–76	30, 25	23, 29	5, 20	2, 15	20, 24	10, 28
Tongue & floor of the mouth	57	40–73	19, 16	14, 18	2, 8	3, 23	16, 19	3, 9
Retromolar trigone	62	50–72	12, 10	8, 10	4, 15	0, 0	7, 8	5, 14
Palate	63	49–74	6, 5	4, 5	1, 4	1, 8	3, 4	3, 9
Labial mucosa	43.5	26–63	4, 3	3, 4	1, 4	0, 0	1, 1	3, 9
Retromolar trigone & buccal mucosa	58	49–67	3, 3	1, 1	0, 0	2, 15	1, 1	2, 6
Buccal mucosa	43.5	42–45	2, 2	0, 0	0, 0	2, 15	2, 2	0, 0
Alveolar mucosa	58	49–67	2, 2	2, 2	0, 0	0, 0	0, 0	2, 6
Floor of mouth & retromolar trigone	61	58–64	2, 2	1, 1	0, 0	1, 8	2, 2	0, 0
Floor of mouth & alveolar mucosa	60	60	1, 1	1, 1	0, 0	0, 0	0, 0	1, 3
Buccal & alveolar mucosa	81	81	1, 1	1, 1	0, 0	0, 0	0, 0	1, 3
Retromolar trigone & gingiva	73	73	1, 1	1, 1	0, 0	0, 0	1, 1	0, 0

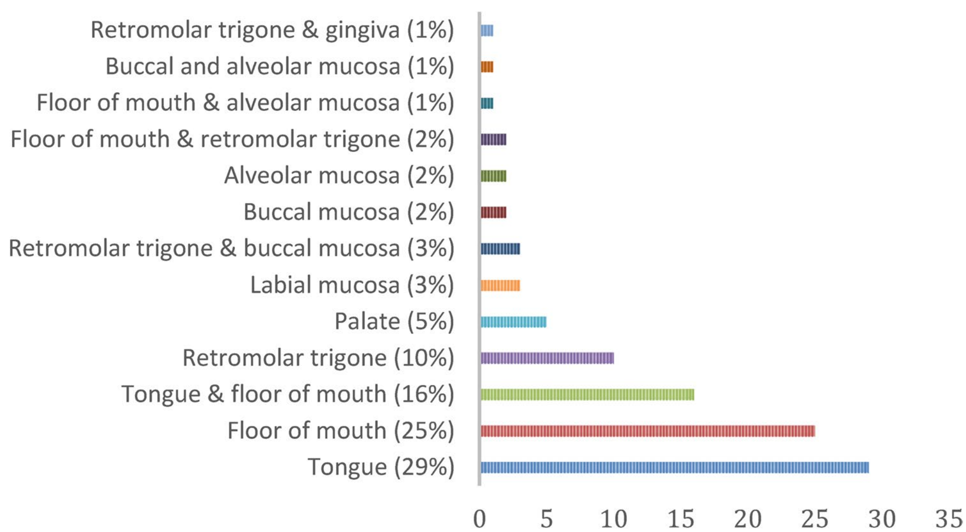

Fig. 2 Distribution of oral mucosal cavity subsite affected. *Percentages calculated excluding one case (1%) with missing subsite information

Subsite distribution differed by race: in black patients ($n = 80$), the floor of mouth accounted for 25%, and the tongue 29%; in White patients ($n = 26$), the tongue predominated (50%) (Fig. 2). Mean age differed significantly (58.85 vs. 63.96 years; $p = 0.021$), and advanced-stage disease was more common among Black than White patients (88% vs. 73%; $p = 0.037$).

Based on the analysis of risk factors, the results showed high tobacco and alcohol use, especially in males. 94% of males and 66% of females reported tobacco use ($p < 0.01$); 73% of males and 49% of females reported alcohol use (see Table 3). Rates were similar with no statistically significant difference. Combined tobacco and alcohol use was associated with higher tumour grade ($p = 0.04$). Combined use of alcohol and tobacco was reported in 76 of 119 patients (64%) (Table 3), representing a substantial overlap between these two major risk factors. As this data was collected retrospectively, alcohol and tobacco use were recorded as binary variables (presence or absence of exposure) without quantitative measures.

Table 3 gives an indication of the risk factors in relation to gender and ethnicity. Striking gender disparities were observed, with males demonstrating significantly higher usage rates for alcohol (73% vs. 49%), smoking (94% vs. 66%), and combined use (71% vs. 46%) compared to females. Among ethnic and gender subgroups, smoking was nearly ubiquitous among Black and White males (96% and 94%, respectively). A notably high rate of smoking was also identified among White females (100%), although this finding is based on a small subgroup ($n = 10$). These results underscore smoking as the most prevalent risk factor in this cohort and highlight

Table 3 Ethnicity and gender in relation to history of alcohol consumption and smoking for the entire study population

Group	*n*	Alcohol Consumers	% Alcohol	Smokers	% Smoking	Combined users	% Combined
Black males	57	42	74	55	96	42	72
White males	16	12	75	15	94	12	75
Other males	11	7	64	9	82	7	64
All males	84	61	73	79	94	60	71
Black females	23	13	57	13	57	12	52
White females	10	4	40	10	100	4	40
Other females	2	0	0	0	0	0	0
All females	35	17	49	23	66	16	46
All black	80	55	69	68	85	53	66
All white	26	16	62	25	96	16	62
Total	119	72	61	102	86	76	64

Table 4 The histopathological grade and clinical stage in relation to the oral mucosal subsite affected

Sites	Histopathologic grading				AJCC Prognostic Stage Group			
	Well differentiated (%)	Moderately differentiated (%)	Poorly differentiated (%)	Missing data (%)*	II (%)	III (%)	IV (%)	Missing data (%)*
Tongue [35]	0	31, 89	3, 9	1, 3	5, 14	1, 3	27, 77	2, 6
Floor of the mouth [30]	1, 3	27, 90	2, 7	0	2, 7	4, 14	23, 77	1, 3
Tongue & floor of the mouth [19]	0	15, 79	4, 21	0	0		84	3, 16
Retromolar trigone [12]	0	9, 75	1, 8	2, 17	0		67	1, 8
Palate [6]	1, 17	4, 67	0	1, 17	1	67	0	1, 17
Labial mucosa [4]	1, 25	3, 75	0	0, 0	0	25	50	1, 25
Retromolar trigone & buccal mucosa [3]	0	2, 67	0	1, 33	0	0	67	1, 33
Buccal mucosa [2]	0	2, 100	0	0	0	0	100	0
Alveolar mucosa [2]	0	2, 100	0	0	0	0	100	0
Floor of mouth & retromolar trigone [2]	0	2, 100	0	0	0	0	2 100	0
Floor of mouth & alveolar mucosa [1]	0	1, 100	0	0	0	0	100	0
Buccal & alveolar mucosa [1]	0	1, 100	0	0	0	0	100	0
Retromolar trigone & gingiva [1]	0	1, 100	0	0	0	0	100	0

*MD: Missing Data: "Missing data" refers to cases where the relevant information was unavailable or not recorded in the clinical files

Abbreviations: *diff* differentiated

Note Percentages are calculated per row (for each anatomic site) and may not sum to 100% due to rounding

Note Stage I category omitted as no patients presented with Stage I disease

significant variations in substance use patterns driven by both gender and ethnicity.

HPV-infection data were unavailable. Although high-risk HPV types contribute to some head and neck carcinomas, current evidence indicates that HPV plays a minimal role in OSCC [15].

Subsite involvement and histopathology

Twenty-seven patients (23%) had multi-subsite involvement, mainly contiguous areas such as the ventral tongue and floor of mouth. Since multifocal disease and contiguous tumour spread could not be distinguished, subsites were aggregated, yielding 143 recorded involvements, but analyses were based on 119 patients (Table 4). Moderate differentiation predominated across all subsites. Missing data were limited to 5 (4.2%) for grades, 10 (8.4%) for stages, and 1 (0.8%) for sites.

It is important to note that for each anatomic site, the percentages for the grading categories (Well, Moderate, Poor, Unknown) are calculated from the total number of cases at that site and sum to 100%. Similarly, the staging categories (I, II, III, IV, Unknown) also sum to 100% for each site.

The pattern of moderately differentiated histology was predominant across most sites. A striking finding was the advanced stage at diagnosis, with a high proportion of tumours across all major sites presenting as Stage IV disease.

Treatment objectives and protocol for radiotherapy

During the period of the study, all patients received two-dimensional radiotherapy, as 3D CRT and IMRT were not yet ubiquitous in the department. None of the patients in this cohort received neoadjuvant radiotherapy or chemotherapy prior to surgery. All cases were managed with radiotherapy either as definitive treatment, as post-operative (adjuvant) therapy, or as palliative therapy, depending on disease stage and surgical findings. 82 patients (69%) of the patients received concurrent chemotherapy/radiotherapy. 56% received definitive chemoradiotherapy, 18% post-operative chemoradiotherapy, 3% post-operative radiotherapy only, 15% definitive radiotherapy alone, and 7% palliative treatment. Curative regimens delivered 66–70 Gy in 33–35 fractions; palliative regimens ranged 20 Gy/5 fractions to 30 Gy/10 fractions. One patient received 30 Gy/15 fractions due to deterioration.

Cisplatin (70 mg/m^2 every three weeks) was radiosensitizer. Although below some international guideline doses, this reflected local constraints, such as patient load and bed capacity. Chemotherapy was omitted in patients ≥ 70 years, with creatinine clearance < 60 mL/min, or poor performance status.

Radiation-induced toxicities

All patients experienced at least one acute toxicity: mucositis (61%), dermatitis (62%), dysphagia (21%), xerostomia (13%), and trismus (6%), as illustrated in Table 5. Many had multiple toxicities (Fig. 3). Haematological toxicity secondary (12%), mainly neutropenia, was confined to chemotherapy recipients. Toxicity incidence was highest in the definitive chemoradiotherapy group ($p < 0.01$). The presence and absence of opportunistic infections, such as oral candidiasis, was not routinely recorded in the patient files and therefore not included in the analysis. Late toxicities were likely under-recorded due to the retrospective design and limited follow-up period (2014–2019).

Discussion

This study examined demographic, clinicopathological, and treatment characteristics of 119 patients treated with OSCC treated with radiotherapy at Charlotte Maxeke Johannesburg Academic Hospital between 2014 and 2019. The tongue (30%) and the floor of the mouth (25%) were the most frequent subsites, consistent with global literature trends where these regions are highly exposed to carcinogens such as tobacco and alcohol [1, 16]. Women in this cohort showed a higher proportion of lesions on the floor of the mouth, possibly reflecting the site's thin, highly vascular mucosa, which enhances carcinogen absorption and radiation sensitivity [6, 17–19]. Chronic local irritation from poor oral hygiene, ill-fitting dentures, or passive smoking may also contribute. Given the mucosa's vulnerability, adherence to meticulous

Table 5 Frequencies of IR-induced toxicities/side-effects in relation to gender, age, ethnicity and AJCC prognostic group stage

Site	Age (years)		Number of patients affected *N* = 119; (%)									
				Ethnicity, *N* = 119			Gender, *N* = 119		AJCC Prognostic Stage Group, *N* = 119 frequency; (%)			
	Mean	Range		Black *n* = 80; (%)	White *n* = 26; (%)	Other *n* = 13; (%)	Male *n* = 84; (%)	Female *n* = 35; (%)	II *n* = 8 (7%)	III *n* = 9 (8%)	IV *n* = 91 (76%)	Missing data *n* = 11 (9%)*
Dermatitis	57.84	26–79	74, 62	49, 61	16, 62	9, 69	59, 70	15, 43	8, 100	8, 89	50, 55	8, 73
Mucositis	58.25	26–76	72, 61	44, 55	18, 69	10, 77	57, 68	15, 43	8, 100	9, 100	48, 53	7,64
Xerostomia	58.73	47–69	16, 13	9, 11	4, 15	3, 23	13, 15	3, 9	3, 38	4, 44	8, 9	1, 9
Altered taste	61.43	52–75	15, 12	9, 11	5, 19	1, 7	12, 14	2, 6	2, 25	1, 11	9, 10	2, 18
Dysphagia	56.4	26–79	25, 21	15, 19	7, 27	3, 23	22, 26	3, 9	2, 25	3, 33	17, 21	3, 27
Fibrosis	56.2	42–72	22, 18	16, 20	4, 15	2, 15	18, 21	4, 11	2, 25	4, 44	12, 13	3, 27
Haematologic	54.58	40–72	11, 9	9,11	1, 4	1, 7	9, 11	2, 6	2, 25	2, 22	6, 7	1, 9
No side-effects	0	0	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0	0, 0

*Missing Data: "Missing data" refers to cases where the relevant information was unavailable or not recorded in the clinical files

Note Stage I disease not observed in this cohort; data for Stages II–IV are presented

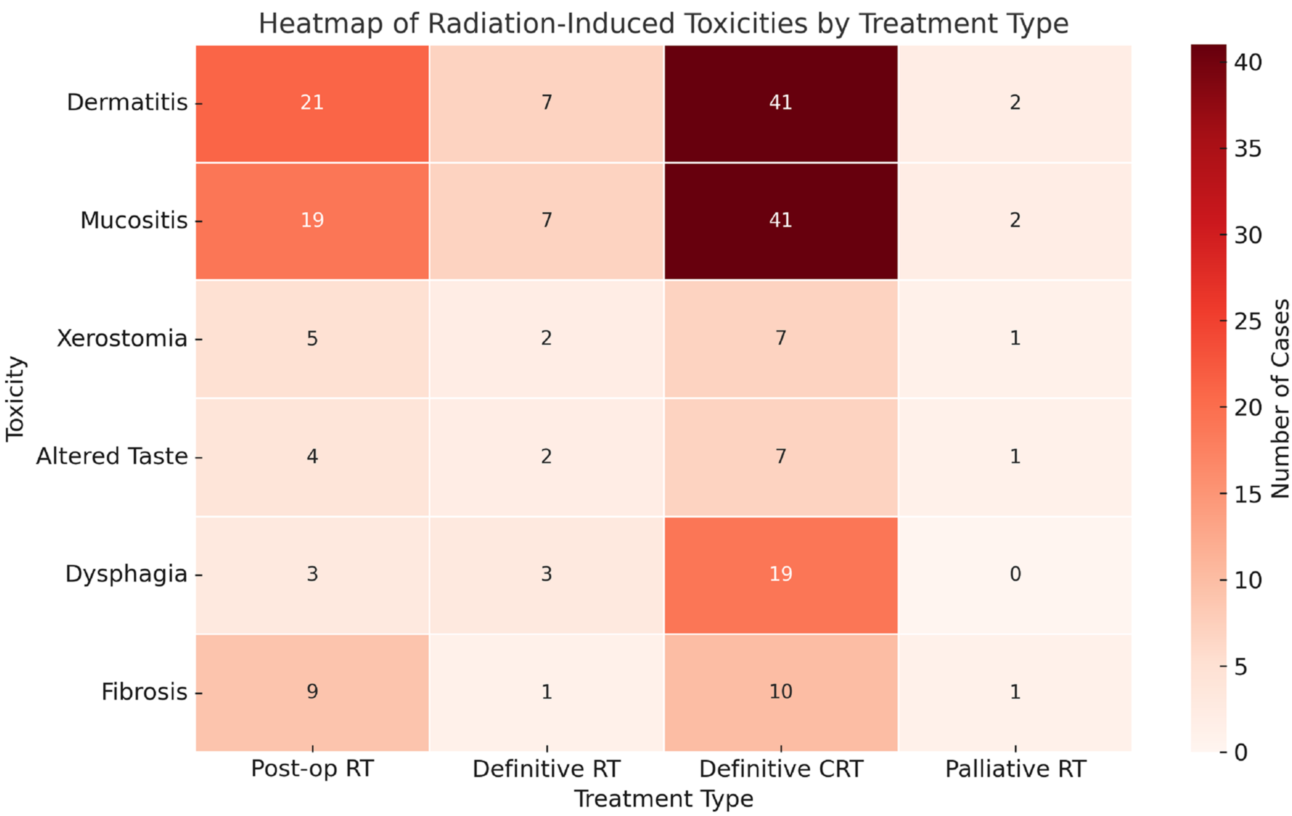

Fig. 3 Heatmap of radiation-induced toxicities by treatment type

mouth-care practices before and during radiotherapy is essential to minimize mucosal injury and improve treatment tolerance [17, 18].

A large proportion presented with advanced-stage (Stage III/IV) disease, particularly in tongue and floor of mouth tumours. This likely reflects both selection bias inherent in this study, as early-stage cases receive surgery and systemic diagnostic delays common in resource-constrained settings. However, survival data could not be assessed due to the retrospective design and lack of longitudinal follow-up.

Although Black African patients were the most represented in this cohort, this finding did not appear to be related to a higher prevalence of alcohol or tobacco use, as rates were comparable across racial groups ($p > 0.05$). The overrepresentation likely reflects underlying demographic distribution and referral patterns in the public healthcare sector rather than a true difference in risk-factor exposure.

Regional comparisons indicate variable site distribution; in high-income countries, earlier detection improves survival [6, 20], whereas in low-and-middle income contexts delayed diagnosis persists. Racial and socioeconomic disparities similar to those described in the United States [1, 16], suggest barriers to healthcare access. In South Africa, limited awareness, absence of oral-cancer screening, and infrequent routine oral examination contribute to late presentation [21].

Fatigue (13%) and nausea (8%) were common general symptoms during radiotherapy and were successfully managed with symptomatic interventions.

The toxicity profiles observed were oral mucositis ([61%] (72/119)), dermatitis (62%), xerostomia (13%), which is consistent with published data [17–19, 22, 23]. Although common, these toxicities were generally manageable with supportive care, and no hospital admissions were required. The comparable rates of radiation dermatitis between racial groups (61% vs. 62%) indicate no protective effect of increased melanin against acute skin toxicity.

Toxicity profiles were consistent with literature, with mucositis and dermatitis as the most frequent complications of radiotherapy. Radiation-induced dermatitis was observed in 62% of patients. Fibrosis was noted in 20% of black and 15% of white patients, with no significant racial disparity ($p = 0.65$).

Overall, the findings highlight late-stage presentation of OSCC, high-risk anatomical subsites, and substantial treatment-related morbidity. These trends underscore the need for improved early detection strategies and enhanced supportive care in public sector oncology.

Limitations

This study is subject to several limitations. Methodological: the retrospective design precluded multivariable regression to adjust for confounders (age, gender, tobacco and alcohol use, and subsite). Consequently, observed associations should be interpreted as descriptive rather than causal. Limited follow-up restricted assessment of survival and late effects. Systemic: referrals originated from multiple facilities with heterogeneous diagnostic quality; earlier-stage cases managed surgically were under-represented, introducing selection bias. Treatment occurred in a resource-limited public hospital, where chemotherapy dosing and radiotherapy technology differ from international norms, affecting external validity. Institutional disruptions, including the COVID-19 pandemic and 2021 fire, further constrained continuity of care. Data quality: reliance on paper-based system increased risk of missing or inconsistent data. Documentation of substance use, and toxicities was variable, and handwriting clarity and language barriers may have introduced misclassification.

Although regression modelling was considered, incomplete data for certain variables limited its feasibility. As such, only descriptive and bivariate analyses were performed to preserve data accuracy and avoid potential bias. Future research should prioritize standardized electronic health records, prospective cohort designs, and multivariable analyses to better define prognostic factors and long-term outcomes. Strengthening early-screening programmes, public awareness, and integrated follow-up pathways could improve timely diagnosis and treatment outcomes for OSCC in South Africa.

Conclusion

This study demonstrates that most OSCC patients treated at CMJAH present with advanced-stage disease, and high-risk subsites, predominating among older males with histories of tobacco and alcohol use. Radiotherapy remains an essential treatment option, though it carries significant acute toxicity and underscores the need for improved supportive-care protocols. Enhanced early detection strategies, systematic community screening, and better referral coordination between surgical and oncology unites could substantially reduce late-stage presentation. Integrating digital record systems and multidisciplinary follow-up clinics will be essential to improve long-term outcomes and strengthen equitable access to comprehensive oral-cancer management in South Africa.

Acknowledgements

The authors would like to acknowledge the University of the Witwatersrand, Charlottee Maxeke Johannesburg Academic Hospital (CMJAH) (IMSIU), Chief Executive Officer (CEO), for allowing them to conduct this study.

Authors' contributions

GF and FM analyzed and interpreted data regarding histology and treatment squamous Cell carcinoma patients and were the major contributors to data analysis of the manuscript. GF and FM performed histological examination of squamous cell carcinoma patients and were the major contributors to interpretation of the data in the manuscript. RK and FM performed supervision, validation, and writing. DMM performed conceptualization and interpretation of the data and were the major contributors to the writing of the manuscript. DR and RK performed writing reviews and editing the manuscript. All authors have read and approved the final manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

The datasets generated and/or analyzed during the current study are not publicly due to privacy agreements but are available from the corresponding authors on reasonable request. For data requests or queries related to this study, please contact Dr Gal Feller at [galfeller@gmail.com](mailto: galfeller@gmail.com).

Declarations

Ethics approval and consent to participate

The patients and the public were not involved in the design, conduct, reporting or dissemination of our studies. The data used in this study were obtained from publicly available patients. This study was conducted in accordance with the ethical standards of the University of the Witwatersrand Human Research Ethics Committee (HREC) and the national guidelines for research involving human participants, as outlined in the South African Ethics in Health Research Guidelines: Principles, Processes and Structures (3rd Edition, 2024, NDoH). The study also adhered to the principles of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethics approval was obtained the University of Witwatersrand Human Research Ethics Committee (HERC) (Medical) (Clearance Certificate No. M220869). Written consent was not required because this was a prospective study on patients' medical records.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 10 August 2025 / Accepted: 23 October 2025

Published online: 22 November 2025

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