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Radiation Induced Xerostomia in Head and Neck Cancer Survivors: A Qualitative Study

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Abstract **Original Research Article**

***Introduction*:** Patients receiving radiation therapy (RT) for head and neck cancers often experience xerostomia, leading to oral discomfort and pain, an increased risk of dental caries and oral infections, as well as difficulties with speaking and swallowing. These issues severely impact quality of life (QOL) and can hinder nutritional intake and the ongoing administration of cancer treatment. The purpose of this work was to explore the head and neck patient's experience of xerostomia after radiotherapy and its impact on quality of life. ***Material and Methods*:** We conducted a descriptive qualitative study with a sample of 65 patients treated by RT for HNC in a curative intent (Total dose 60 ≥ Gy), at least 6 months earlier and actually without evidence of disease. All patients completed a xerostomia questionnaire consisting of three parts (xerostomia score, quality of life survey, and visual analogue scale). ***Results*:** A high proportion of patients (94%) experienced dry mouth, with 61,5% presenting moderate to severe xerostomia (graded 2–3). Dysphagia (47%) and taste impairment (63%) were prevalent, whereas oral pain was reported in only 12% of cases. Xerostomia also had notable emotional consequences, triggering worry (58%), tension (52%), or depressive feelings (37%). Additionally, patients described difficulties in communicating (63%) and sharing meals (57%) with others, with 73% reporting limitations in food quantity and variety. Quality of life reductions were significantly correlated with elevated radiation doses, or concurrent chemotherapy administration. ***Conclusion*:** Radiation-induced xerostomia is often a permanent condition that significantly affects the patient's well-being. Concurrent chemotherapy may worsen radiation-induced oral complications. These findings highlight the urgent need to develop innovative radiation therapy (RT) techniques that spare salivary glands and prioritize targeted therapies to reduce radiation-induced dry mouth.

Keywords: Xerostomia, Dry Mouth, Head and Neck, Cancer, Radiotherapy, Quality of Life.

INTRODUCTION

Xerostomia, characterized by the sensation of dry mouth, is the most common complication experienced during and after radiotherapy for head and neck cancer (HNC). Studies estimate that 60–90% of HNC patients develop some degree of xerostomia [1-3]. While symptoms often persist for months or years, they may become permanent in certain cases [4]. The primary cause of dry mouth is radiation-induced damage to the salivary glands, particularly the parotid glands and, to a lesser degree, the submandibular glands [5]. Radiation can alter both the quantity and quality of saliva, impairing gland function [5].

Patients suffering from xerostomia experience oral discomfort or pain, struggle with speaking, chewing, or swallowing, and are at higher risk of dental caries or oral infections [6]. Since no effective cure for xerostomia exists, preventive measures are critical [7]. Modern radiation techniques can partially spare the salivary glands, thereby avoiding permanent xerostomia [8, 9]. As survival rates improve, a growing population of HNC patients continues to endure persistent xerostomia both during and after radiotherapy.

Multiple methods exist for assessing salivary gland toxicity [10]. Salivary flow rate measurements remain the most widely used objective tool for evaluating salivary gland function [11]. Imaging modalities, such as salivary gland scintigraphy or magnetic resonance imaging (MRI), may also be employed to diagnose hyposalivation [12, 13]. However, since xerostomia is

inherently a subjective symptom, it is equally critical to evaluate the patients' personal experience of oral dryness. Some studies emphasize that patient-reported outcomes, rather than clinician assessments, should serve as the primary endpoints in xerostomia evaluation [14].

The objective of this study was to describe the experience of radiation-induced xerostomia in the daily lives of Moroccan patients with head and neck cancer and its impact on quality of life.

MATERIEL AND METHODS

Study Design

This research followed a qualitative descriptive design. Semi-structured interviews were utilized for data collection, conducted between January and June 2025.

Population Study

Sixty-five patients who had undergone radiotherapy for head and neck cancer (HNC) at the national institute of oncology in Rabat, Morocco, were invited to complete a xerostomia questionnaire (XQ) after their routine follow-up appointments at the post-treatment control consultation unit.

Eligible participants were aged ≥18 years and had undergone radiotherapy (RT) for head and neck cancer (HNC) at a total dose exceeding 60 Gy, at least six months prior to participation. Exclusion criteria comprised individuals with persistent/recurrent malignancies, Sjögren's syndrome, or other systemic conditions contributing to xerostomia. Patients were purposively selected to ensure the sample represented diversity in age, gender, xerostomia severity, disease phase (acute or late-stage), and treatment approaches.

Participants had not received xerostomia-specific therapies (e.g., saliva substitutes, stimulants) beyond routine hydration (e.g., water intake) and no preventive strategies (e.g., salivary gland-sparing RT or amifostine) prior to enrolment.

Ethical Considerations

All participants received a thorough explanation of the study's purpose and methodology, and written informed consent was obtained prior to data collection. Participation was voluntary, with participants retaining the right to withdraw at any time without justification. To safeguard confidentiality, patient data were assigned anonymous numeric codes during transcription, ensuring no personally identifiable information appeared in the presentation or analysis of results.

Data Collection

The data were gathered through in-person, semi-structured interviews. The interviews were carried out by the first author (RL) in a room adjacent to the outpatient clinic, following the participants' consultations with a physician. Each interview lasted between 20 and 30 minutes. Patients were asked to answer the Xerostomia Questionnaire (XS) that where translated from English to Moroccan dialect to ensure a good understanding of the different items. All patients' responses were translated from Moroccan dialect to English by a bilingual researcher. Two bilingual team members independently verified the translation accuracy.

The Xerostomia Questionnaire (XQ) comprised three components [1]. First, participants rated the severity (on a scale of 0–3) of xerostomia, oral pain, taste impairment, and dysphagia, and reported whether they experienced increased tooth decay or denture-related issues following radiotherapy (RT) (yes/no). Second, patients answered 15 questions assessing the perceived impact of xerostomia on their quality of life (QoL). For each item, they indicated their agreement on a 1–5 scale. A cumulative QoL score was calculated (100 minus the sum of all scores) to reflect the overall burden of xerostomia. Third, the XQ incorporated a 100-mm Visual Analogue Scale (VAS), where patients marked their subjective xerostomia severity, ranging from 'no xerostomia' (normal saliva) to 'total xerostomia' (complete absence of saliva). The VAS scores were categorized into a four-grade scale: Grade 0 (VAS score ≤ 24) Grade 1 (VAS score between 25 and 49) Grade 2 (VAS score between 50 and 74) and Grade 3 (VAS score ≥ 75) [1].

Statistical Analysis

The data were analyzed using SPSS (Statistical Package for the Social Sciences) software. The statistical significance and independence of each parameter in predicting the severity of xerostomia experienced by patients were assessed using multiple linear regressions.

Correlations among the xerostomia symptom score, QoL score, and VAS score were analyzed. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 65 patients (39 male, 26 female), aged 39–83 years (mean age= 61), participated in the study. Tumor sites, stages, and treatment modalities are detailed in Table 1. Treatment plans were determined by a multidisciplinary team in accordance with institutional guidelines: 17 patients (26,1%) underwent surgery followed by radiotherapy (RT), 20 (30,8%) received definitive RT, and 28 (43,1%) were treated with exclusive concomitant chemoradiation.

The mean total radiation dose delivered was 64.2Gy (range: 60–70 Gy). All patients received volumetric modulated arc therapy (VMAT). The mean post-RT follow-up period was 26,3 months (range: 3–73 months).

Table 1: Demographic, tumor and therapy data

Characteristics	Number of patients
Age (mean age= 61)	
≤60 years	14
>60 years	51
Gender	
Male	39
Female	26
Tumor site	
Larynx	25
Oral cavity	18
Hypopharynx	10
Oropharynx	8
Other (maxillar sinus, lymphomas)	4
T Stage	
T1	2
T2	10
T3	22
T4	31
N Stage	
N0	9
N1	13
N2	24
N3	28
Total dose	
60 GY (2GY/fr)	11
66 GY (2GY/fr)	16
70 GY (2GY/fr)	37
Other	1
Treatment modality	
Adjuvant radiotherapy	10
Adjuvant chemoradiotherapy	19
Exclusive radiotherapy	15
Exclusive chemoradiotherapy	21

Xerostomia severity was graded as follows: 21 patients with grade 1, 15 with grade 2, and 25 with grade 3 (results shown in Fig. 1). Of these, 16 patients were in the acute toxicity phase (<6 months post-RT), and 49 were in the late phase (≥6 months post-RT).

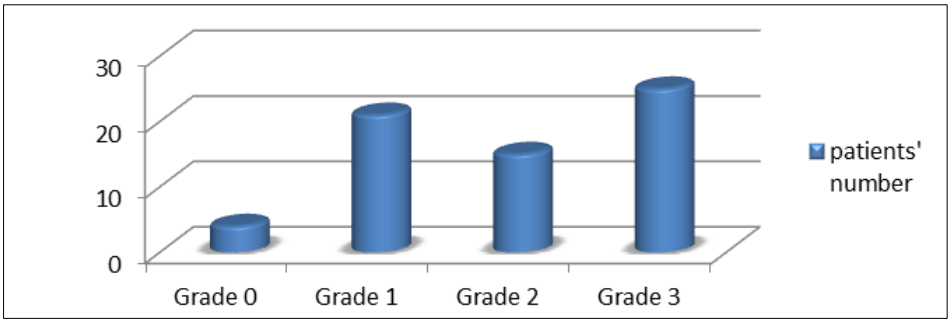

Figure 1: Xerostomia grade

Only four patients (6%) reported no symptoms of dry mouth. The second most common complaint was taste impairment (n=41, 63%), followed by dysphagia (n=31; 47,7%). A minority of patients experienced pain (n=8, 12%). These findings are summarized in Figure 2.

Of the 32 patients who had natural teeth before radiotherapy (RT), 72% (n=23) noted accelerated tooth decay, and 28% (n=9) required dentures following RT. Among patients who used dentures prior to treatment

(n=16), 62,5% (n=10) reported increased difficulty with denture use post-treatment.

Xerostomia significantly impacted quality of life (QoL). The mean QoL score was 62 (range: 29–87), with a median score of 65 ± 14.2. Patients' responses in the quality-of-life section of the questionnaire highlighted the significant repercussions of xerostomia on various aspects of daily life. These included psychological and emotional effects, social impact, and physical consequences particularly on oral and digestive health.

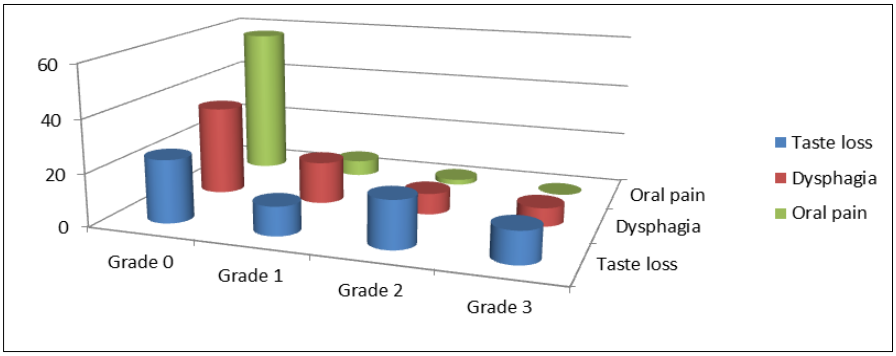

Figure 2: Patient's estimation of taste loss, dysphagia and oral pain following radiotherapy

Regarding the psychological impact of xerostomia, patients' feedback underscored notable effects on emotional well-being. Over half of respondents experienced worry (58,4%) or tension (52%), with 43% describing their dry mouth as permeating every aspect of their lives. Additionally, 37% reported feeling 'depressed.' When quantifying severity, 12% cited depression as affecting them 'quite a lot' or 'very much.' Notably, 21% indicated that their dry mouth diminished their will to live, with 3% endorsing this sentiment 'very much.

Responses to questions assessing social functioning revealed similarly significant challenges. Approximately half of patients reported difficulties engaging in conversations (63%) or sharing meals (57%) with others, leading to limitations in their social lives (37%) and daily activities (32%). In parallel, 15% expressed concerns about the appearance of their teeth and mouth and 21,5% acknowledged issues affecting their intimate relationships.

Oral discomfort was reported by a majority of patients (n=83). Xerostomia profoundly influenced dietary habits: 73% felt restricted in the amount and/or type of food they could consume. Additionally, 64% experienced reduced or altered taste perception. Strikingly, 30% of patients viewed the prospect of living with their current level of xerostomia (persisting at least 6 months post-treatment) for the rest of their lives as a dire outcome.

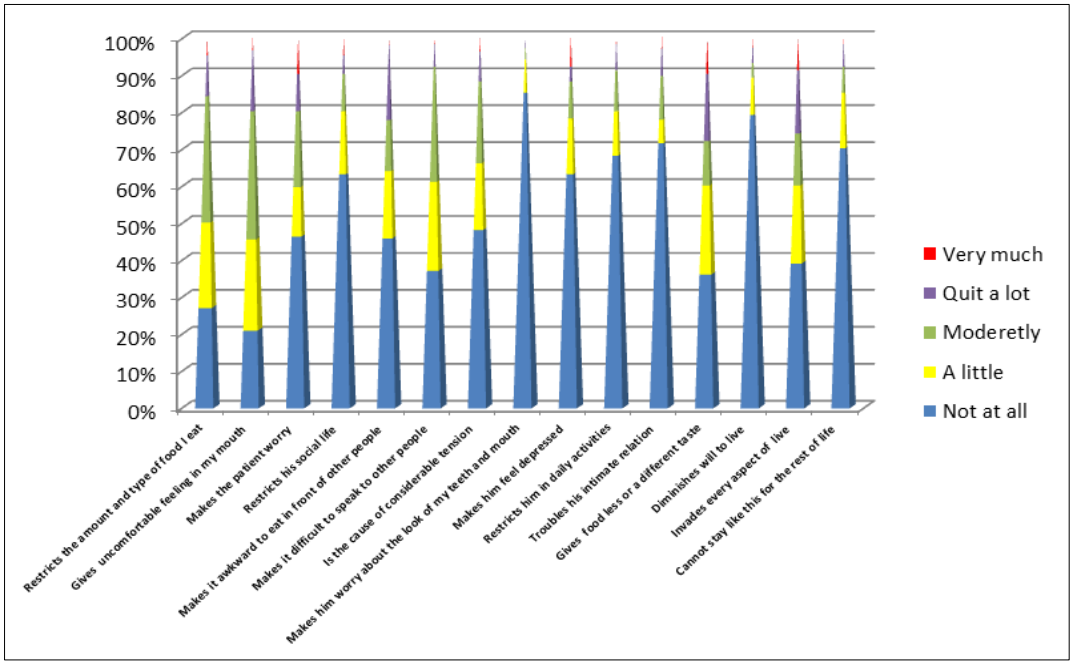

Figure 3: the impact of xerostomia on various aspects of quality of life

The severity of reported xerostomia was significantly associated with more advanced clinical stage (p = 0.02), chemotherapy use (p = 0.002), and radiation doses ≥60 Gy (p = 0.005). Results of the multivariate analysis are shown in Table 2.

Both chemotherapy (p = 0.02) and high-dose radiation ≥60 Gy (p = 0.01) independently predicted distinct QoL impairments, with chemotherapy exacerbating oral dysfunction and radiation intensifying psychosocial distress. Advanced disease stage and T classification further compounded these effects.

Table 2: Multivariate analysis Results

variable	Xerostomia	Dysphagia	Pain	QOL
Age (< vs ≥55 years)	-	-	-	0,08
T classification (T1–2 vs T3 –4)	0,02	-	-	0,04
N classification (N0 vs N+)	-	0,06	-	-
CT (no vs yes)	0,002	-	-	0,02
Surgery (no vs yes)	-	-	0,05	-
Dose (< vs ≥60 Gy)	0,005	-	-	0,01

The mean Visual Analogue Scale (VAS) score for xerostomia was 56.4 (range: 0–100), with a median score of 59 (±28). When categorized by severity, the VAS scores corresponded to the following grades: 15 patients (23%) reported grade 0 (no xerostomia), 19 (29%) grade 1 (mild), 15 (23%) grade 2 (moderate), and 16 (25%) grade 3 (severe) xerostomia.

DISCUSSION

This study aimed to explore the lived experience of radiation-induced xerostomia among patients with head and neck cancer (HNC). Findings revealed that xerostomia was not merely a physiological symptom but also exerted a pervasive, multidimensional burden, profoundly disrupting patients' sociocultural interactions, emotional well-being, and overall quality of life [15].

Xerostomia is a severe and nearly universal complication following radiotherapy (RT) for head and neck malignancies [1]. In this study, 93,8% of patients reported dry mouth, with 61,5% experiencing moderate to severe xerostomia (grade 2 or 3) and only 4 patients not suffering from dry mouth after treatment. These findings align with prior studies on xerostomia incidence in head and neck cancer (HNC) patients. Epstein *et al*., [2], observed that 77.8% of 65 patients assessed >6 months after conventional RT suffered moderate to severe xerostomia, while only 9.2% reported no oral dryness. Similarly, Wijers *et al*., [3], found that 64% of 39 long-term survivors (≥2 years post-RT) had moderate to severe xerostomia, with all patients reporting some degree of dry mouth. While, dirix *et al*., reported that 93% of patients suffered from dry mouth at least 6 months post-treatment, with 65% experiencing moderate to severe xerostomia (grade 2 or 3) [1].

Also, most head and neck cancer patients described dysphagia, loss of taste, and either difficulty managing dentures or increased incidence of tooth decay linked to xerostomia after radiotherapy [16]. This is consistent with the results of our study.

It is well-established that xerostomia profoundly impacts the quality of life of head and neck cancer (HNC) patients long after radiotherapy [17, 18]. In this study, xerostomia and its associated symptoms significantly disrupted the psychological well-being of patients. Most participants reported persistent discomfort, tension, and irritation linked to chronic dryness. These findings align with Rydholm and Strang, who documented feelings of shame, anxiety, disappointment, and embarrassment among palliative cancer patients with xerostomia [19]. Such psychological distress often cascaded into social dysfunction. Mirroring prior researches [19-22], participants in our study increasingly avoided social interactions, opting instead for solitude or quiet environments.

Prior research has consistently documented significantly reduced quality of life (QoL) among head and neck cancer (HNC) survivors, with xerostomia emerging as a major contributing factor [23-28]. Thus, managing xerostomia poses a significant and multifaceted challenge not only for patients but also for healthcare providers and the broader healthcare system.

Administration of concomitant chemoradiotherapy for head and neck cancer (HNC) may elevate both the incidence and severity of acute and long-term complications [29]. In this analysis, concurrent chemotherapy use was significantly associated with a higher risk of xerostomia, and reduced quality of life (QoL).

A critical consideration is the variability in patient experiences of xerostomia, as highlighted in prior research [30, 31]. Standardized instruments assessing subjective perceptions of dry mouth remain the most effective tool for capturing the nuanced psychosocial and functional burdens unique to each individual. In contrast, objective salivary flow measurements, while quantifiable, fail to account for critical psychological and contextual factors. Consequently, these metrics often underestimate the lived reality of xerostomia, with studies demonstrating discordance between salivary

output and patient-reported outcomes, particularly in cases of persistent xerostomia symptoms over extended post-RT periods [32].

CONCLUSION

Xerostomia following radiotherapy (RT) for head and neck cancer (HNC) remains highly prevalent and profoundly impacts quality of life (QoL). Symptoms persist chronically without significant recovery over time, and concurrent chemotherapy may exacerbate radiation-induced oral complications. These findings underscore the critical need for advancing innovative salivary gland-sparing RT protocols and prioritizing the development of targeted therapies to mitigate radiation-induced xerostomia.

Healthcare systems must prioritize the development of integrated symptom management platforms tailored to radiation-induced complications (e.g., xerostomia). Such platforms would empower patients, families, and clinicians by providing evidence-based guidance on self-care practices, symptom alleviation strategies, and therapeutic interventions. This proactive approach could enhance patient autonomy, improve clinical outcomes, and foster interdisciplinary collaboration in managing long-term treatment sequelae.

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