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Review article

Strategies to manage the oral health impacts of head and neck cancer treatment: A scoping review

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ABSTRACT

Objectives: This review aimed to: (1) provide a detailed characterisation of strategies reported in the literature to manage oral health impacts of head and neck cancer (HNC) treatment; (2) describe and analyse the outcomes associated with these strategies; and (3) explore their effectiveness in improving oral health and patient well-being.
Data Sources: A scoping review was conducted using the JBI framework and PRISMA-ScR checklist. Systematic searches across major electronic databases identified studies reporting oral health interventions for HNC patients across pre-treatment, treatment, and post-treatment phases.
Study Selection: Thirteen studies were included. Reported strategies comprised preventive interventions (such as educational programs and preventive dental care), dental procedures, technology-assisted tools, and interprofessional models of care. These approaches demonstrated positive impacts but also revealed key gaps, including limited continuity of oral health support, unclear optimal intervention points, and underdeveloped approaches to patient self-management that could reduce reliance on healthcare resources.
Conclusions: Comprehensive, multidisciplinary strategies are essential to improve oral health outcomes and quality of life for patients with HNC. However, systemic inequalities and the absence of standardised protocols continue to restrict effective implementation. Development of evidence-based guidelines, integrated care models, and appropriately timed interventions are critical to advance oral health management in cancer care.
Clinical significance: This review highlights effective oral health management strategies for patients undergoing head and neck cancer treatment, including preventive care, education, technology-assisted tools, and interprofessional collaboration. The findings can guide clinicians in delivering timely, patient-centred oral health support, inform policy on integrating dental care into cancer pathways, and empower patients through self-management. Adoption of these approaches may improve quality of life, treatment outcomes, and healthcare efficiency in head and neck cancer care.

1. Introduction

Head and neck cancer (HNC) is the seventh most frequently diagnosed cancer globally, with approximately 890,000 new cases reported annually [1]. Over the past decade, the incidence of HNC in Australia has increased by 34 % [39]. Several contributing factors to this notable increase in incidence include: high levels of alcohol consumption [7], rising rates of obesity [11], and infection with the human papilloma virus (HPV) [36], which are all risk factors for HNC. Additionally, while daily tobacco smoking has reduced by around 2 % in Australia over the last 5 years, lifetime use of e-cigarettes has increased significantly in this time, by around 8.5 % and may be implicated in the risk of HNC, however long term studies are needed to confirm this [14,38]. In Australia, around 5300 individuals are diagnosed each year, while over

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17,000 people manage the long-term side effects of HNC treatments [13]. Additionally, the incidence rate for HNC is increasing with age, highest for those aged 80–84 years [12].

Advancements in treatment modalities, including surgery, radiotherapy, chemotherapy, and targeted therapies, have significantly improved survival rates. However, these treatments often severely damage oral tissues, causing a range of complications that are detrimental to patients' quality of life [10]; impacting essential functions of the oral cavity include speaking, chewing, swallowing, and breathing. Therefore, maintaining oral health is critical for overall well-being in all stages of HNC management including long-term survivors [4].

Treatments for HNC are associated with both acute and long-term oral complications [37]. Acute issues, such as mucositis, infections, altered salivation and neurosensory function, are commonly experienced during treatment. Long-term survivors may face persistent problems, including xerostomia, dysgeusia, reduced oral functionality, dental decay, periodontal disease, and osteoradionecrosis (ORN) [37]. These complications not only affect appearance but also cause considerable functional impairments, emphasising the need for timely and effective oral health interventions [10].

Current strategies for managing oral health in HNC patients involve a multidisciplinary approach across the pre-treatment, treatment, and post-treatment phases [27,39]. Preventive measures delivered across all treatment phases, such as educational resources for oral hygiene maintenance and fluoride application, alongside clinical interventions such as supportive medications and low-level laser therapy, are essential for managing complications including dry mouth, mucositis, and pain [6, 34]. Additionally, multidisciplinary support during and post-treatment, including nutritional counselling and speech therapy, plays a crucial role in comprehensive care [35]. This multidisciplinary support generally integrates the expertise of oncologists, nurses, dental practitioners and carers, among other healthcare professionals [9]. However, there is currently no coordinated or standardised protocol for oral health support in HNC patients in Australia or internationally. There is a need to evaluate existing methods and accordingly develop evidence-based strategies for treating and limiting the oral side effects of HNC treatment.

This review aimed to provide a comprehensive overview of oral health management strategies for patients undergoing HNC treatment.

The review objectives were:

1. To provide a detailed characterisation of the strategies identified in the literature.
2. To describe and analyse the types of outcomes reported in relation to these strategies.
3. To explore the effectiveness of the identified strategies in improving oral health outcomes.

2. Methods

The methodological approach for this review was guided by the JBI framework [33], and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist [30].

2.1. Eligibility criteria

The inclusion and exclusion criteria for this review were designed to ensure a thorough but focused evaluation of oral health management strategies for patients with HNC. Studies addressing health promotion and prevention strategies across all treatment stages—pre-treatment, in-treatment, and post-treatment—were included to provide a holistic understanding of HNC care. Diverse study designs, such as randomised controlled trials (RCTs), cohort studies, case-control studies and clinical guidelines were considered to capture both empirical evidence and real-world practices. Only English-language publications with evaluations of intervention effectiveness were included, ensuring accessibility and relevance for informing clinical and policy decisions.

Exclusion criteria were applied to maintain the review's scope. Studies reporting on cancers other than HNC, or those without an oral health component, were excluded to ensure relevance to the target population. Secondary research, non-human studies, and articles without full-text access were also excluded to guarantee feasibility and rigorous assessment. Furthermore, studies that lacked an evaluation of intervention outcomes were omitted, as they did not contribute actionable evidence. Finally, studies published prior to 2014 were excluded in order to maintain a contemporary focus on oral health management relating to HNC. Collectively, these criteria ensured that the review provided relevant insights into effective oral health management strategies for HNC patients. The inclusion and exclusion criteria are summarised in Table 1.

2.2. Information sources and search strategy

The search strategy was structured using the PIO framework (Population, Intervention, Outcome) to ensure a focused and systematic approach. The population included individuals undergoing treatment for HNC. Interventions encompassed a range of oral health management strategies, including preventive care, clinical interventions and supportive measures across all treatment stages. Outcomes of interest included oral health-related complications from cancer treatment, such as mucositis and xerostomia.

Databases searched included MEDLINE (via Ovid), CINAHL, EMBASE, and COCHRANE. Backward and forward citation tracking was performed to ensure comprehensive coverage. The final search was executed on 27/09/2024. The search strategy incorporated Boolean operators, truncations, and MeSH terms tailored to each database. Examples of search terms include "head and neck cancer," "chemotherapy", "mucositis", and "artificial saliva". The Medline (Ovid) search strategy and syntax, along with the number of papers retrieved for each search line, is shown in Supplemental Table 1.

2.3. Data collection process

Search results were exported into EndNote reference management software, where duplicates were identified and removed. Titles and abstracts were screened, based on the inclusion/exclusion criteria, independently by two reviewers using Covidence. Discrepancies were resolved through consultation with a third reviewer. Full-text articles were assessed for eligibility using the same method for the title-abstract screening. Data extraction was conducted using a standardised evidence table, developed for previous reviews, with one reviewer performing the extraction and a second reviewer verifying the extracted data from at least 10 % of included papers. Extracted data included study design, setting, aim, interventions, outcomes, and key results. Colour coding was employed during data extraction to categorise various interventions and facilitate the identification of emerging themes, enhancing the clarity and organisation of the synthesis process.

Table 1
Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Studies addressing health promotion and prevention strategies across any HNC treatment phase.	Studies on HNC without an oral health component or focus.
Studies focusing on HNC.	Studies on cancers other than HNC.
Studies in the English language.	
RCTs, cohort studies, case-control studies and clinical guidelines.	Non-human studies, secondary research.
Studies published from 2014 onwards.	
Studies with full-text access.	

2.4. Synthesis methods

A narrative synthesis was employed to summarise findings. Patterns and gaps were identified, with a focus on intervention effectiveness and patient outcomes.

3. Results

3.1. Study selection

A total of 283 studies were initially identified through database searches, and further two studies identified from other sources through citation searching, resulting in a total of 285 records. Following screening, 13 studies met the inclusion criteria and were included in this review (Fig. 1).

3.2. Study characteristics

Table 2 presents the summary characteristics of the included studies. The majority of the included studies were published in the last four years ($n = 8$) and were mainly from Asia ($n = 6$), the USA ($n = 4$), Canada ($n = 1$), Australia ($n = 1$), and Brazil ($n = 1$). The most reported outcome was quality of life (58.3 % of studies), followed by oral mucositis symptoms (41.7 %).

Table 3 shows the oral health management strategy of the studies, with demographic characteristics of the study population. The review identified several different strategies for oral health management in patients undergoing treatment for HNC. Preventive interventions (encompassing supportive education, oral care kits and fluoride application) were the most prevalent strategies identified; technology-assisted tools were reported in only two of the studies.

Fig. 2 explores the distribution of the key intervention themes by treatment phase frequency. Preventive interventions and technology-assisted tools were largely equally implemented across all treatment phases. Dental procedures were mostly implemented pre- cancer treatment, and interprofessional collaborations were only utilised during treatment.

Table 4 shows the oral health outcomes by treatment type. Radiation therapy was the most reported treatment type, with only three studies reporting a combination of radio-chemotherapy. Quality of life was the most commonly reported patient-reported outcome, while mucositis was the most frequently documented clinical outcome.

Table 5 shows the follow-up period and impact of the oral health management strategies. The reported maximum period of follow-up

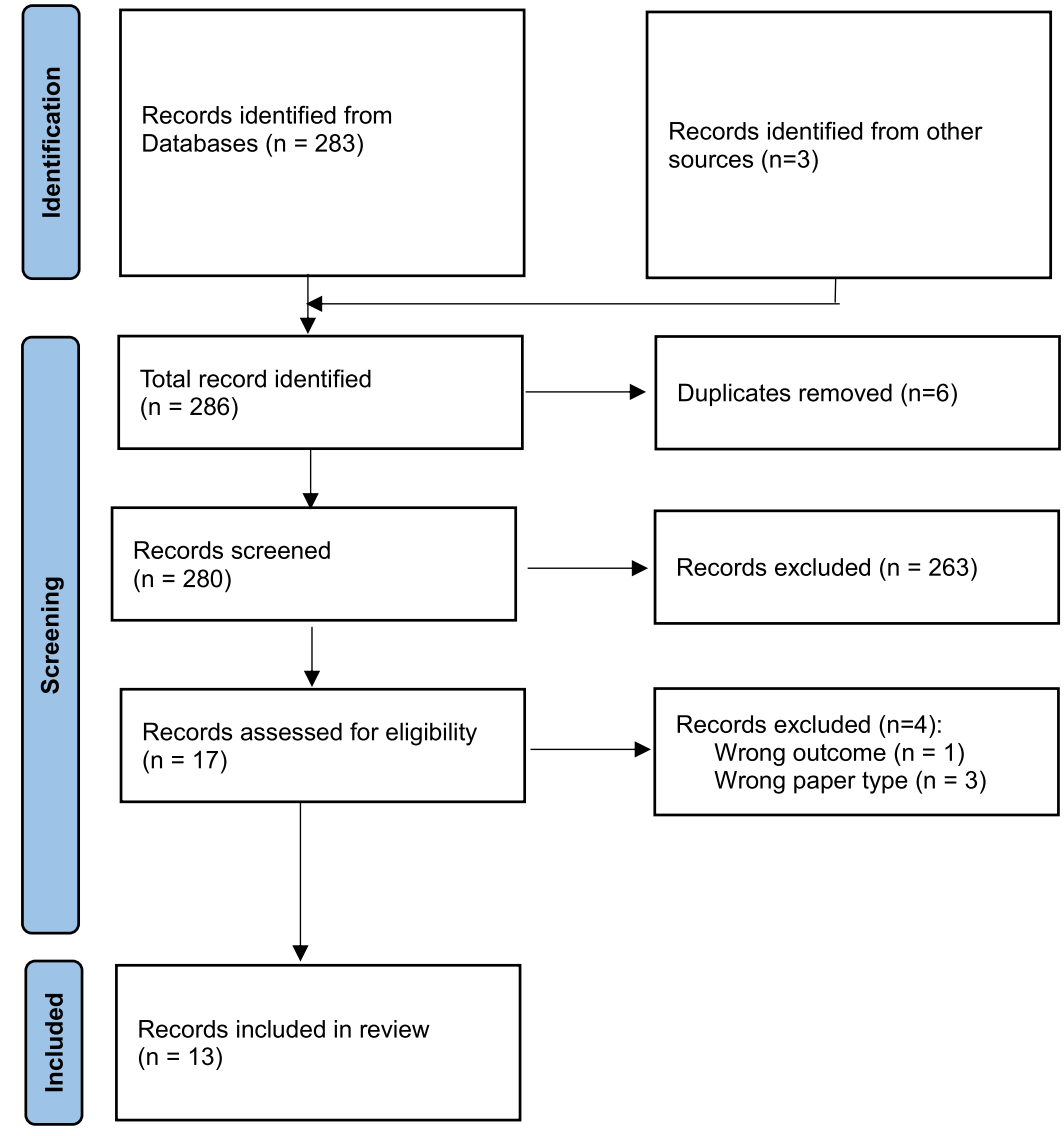

Fig. 1. PRISMA flow diagram.

Table 2
Summary characteristics of included studies ($n = 13$).

	n (%)
Publication type	
Primary study	13 (100.0)
Primary study design	
Observational	7 (53.8)
Experimental	6 (46.1))
Reported outcomes	
Patient perception on oral care/quality of life	7 (53.8)
Oral mucositis symptoms	6 (46.2)
Clinician knowledge and perceptions	3 (23.1)
Dental caries experience	3 (23.1)
Plaque score	2 (15.4)
Bleeding on probing/gingival index	3 (23.1)
Osteoradionecrosis	1 (7.7)
Salivary flow rate/xerostomia	2 (15.4)
Nutrition assessment	1 (7.7)
Opioid dosage/use	1 (7.7)
Location of study	
United States	4 (30.8)
Australia	1 (7.7)
South Korea	1 (7.7)
Canada	1 (7.7)
Japan	2 (15.4)
Taiwan	1 (7.7)
China	2 (15.4)
Brazil	1 (7.7)

after cancer treatment with radiotherapy was 3 years. Supportive education, either alone or in combination with other interventions, consistently showed benefits. Studies by Jiang et al. [15,16] reported improvements in xerostomia symptoms, increased unstimulated saliva flow, reduced plaque levels, and better oral health-related quality of life, although changes in gingival inflammation and dental caries were not statistically significant. Similarly, Lee et al. found improvements in plaque and bleeding scores, as well as in quality of life domains such as swallowing, speech, and sexuality [18]. Morais et al. and Elad et al. demonstrated that supportive education combined with dental procedures and photobiomodulation therapy reduced oral mucositis severity and minimised treatment interruptions [8,26]. Dental procedures alone were also important; Beech et al. observed that pre-treatment extractions and osteoradionecrosis were associated with poorer quality of life, whereas excellent oral hygiene was linked to better outcomes [2].

Technology-assisted tools also showed potential in supporting patients throughout radiotherapy. Lin et al. reported that digital interventions helped reduce oral mucositis, alleviate pain, and improve nutritional status [21]. Ma et al. found that a chatbot was effective in supporting symptom self-management, with most users finding it helpful and easy to use, though engagement declined over time due to various reasons including cancer treatment fatigue, chatbot algorithm rigidity and preference for clinician interaction [23]. Oral care kits, as described by Cullen et al., led to improved oral hygiene and reduced mucositis, alongside enhanced clinician awareness of oral care importance [5]. Interprofessional collaboration, particularly pharmacist involvement in recommending relevant oral care products to patients during HNC treatment, was associated with delayed onset and lower incidence of mucositis [41].

4. Discussion

This review provides important insights on current strategies to manage the oral health of patients undergoing treatment for HNC, broadly identified as preventive interventions, dental procedures, technology-assisted tools and interprofessional collaboration. The literature shows that oral health can be managed before, during, and after cancer treatment; however, interventions timed to specific stages of the cancer journey may be more effective. The review also highlights the lack of a standardised approach for managing oral health during specific stages of HNC treatment. This may be due to the specific oral health issues associated with various stages of HNC treatment, as well as the varying response to treatment by patients.

The lack of structured and coordinated approaches to oral health care for cancer patients in Australia was reflected in the recent Senate Select Committee into the Provision of and Access to Dental Services in Australia [22]. The committee's commentary highlighted the inadequacy of dental care for cancer patients, particularly in the public sector, where funding and resources fail to address the specialised needs of HNC patients. While there is a 2015 Optimal Care Pathway published for people with HNC (modified in 2020) [29], this document outlines possible care pathways rather than clinical practice guidelines. Additionally, it does not include recommendations for management of oral sequelae of HNC treatment. Overall, this lack of standardisation and absence of clinical guidelines for oral health care during HNC treatment drives inequalities in care.

This review was important to identify existing strategies to improve oral health outcomes with respect to HNC treatment. Of the four main oral health strategies identified (dental procedures, preventive interventions, technology-assisted tools, and interprofessional collaboration); supportive education and technology-assisted tools may be especially effective for prevention and reinforcing clinician-recommended self-management. These approaches can ease pressure on the Australian healthcare system, enhance clinical care, and improve patient outcomes.

Dental procedures are a vital component of oral health management during cancer delivery. However, to be effective, treatment pathways require prospective testing to evaluate outcomes of tooth-specific dental interventions [40]. Patients undergoing more than eight dental extractions experienced a decline in oral health-related quality of life, particularly due to ORN development, reduced chewing ability, poorer nutritional status and social impacts associated with tooth loss [2]. This review highlights that as a strategy, dental procedures may refer to tooth extractions, and should be followed up with rehabilitation to replace the missing teeth and optimise oral health-related quality of life outcomes [24]. As such, dental procedures in isolation may not be an adequate oral health management strategy for patients with HNC.

Six studies reported effectiveness of supportive education in improving patient oral health outcomes related to cancer treatment. Improvements in oral hygiene practices and quality of life were evident [5,15,16,40], as well as a reduction in mucositis severity, plaque and bleeding scores and xerostomia [5,8,15,16,18]. Interestingly, a 2025 study showed that an education based intervention protocol was effective in delaying the onset of several treatment related complications such as oral mucositis, chewing difficulty, and swallowing difficulty; however the intervention could not prevent them entirely [31]. Supportive education addresses the need for remote and affordable oral health support for patients with HNC and can be utilised to promote patients' self-management of oral health issues during cancer treatment, when delivered in a timely and personalised manner. Further studies should investigate the effectiveness of supportive education in enabling self-management of oral health issues during HNC management, in order to further streamline oral health care, promote patient independence, and minimise equity issues associated with lack of frequent and prompt access to healthcare providers.

Technology-assisted tools were also reported in the literature as a means to provide additional support and education to patients for symptom management. Implementing a chatbot that provided educational content and supported self-management of oral symptoms reduced the number of required clinician interventions [23]. Reducing the number of required dental visitations during HNC treatment is valuable in the Australian context as access to specialised dental care remains a barrier for some patients, compounded by the inability for HNC patients to access dental care through Medicare [25]. Similarly, a mobile app aimed at assisting patients to manage oral mucositis symptoms during HNC treatment offered educational resources, symptom

Table 3
Characteristics of identified oral health management strategies for head and neck cancer patients.

Study	Oral health management strategy	Strategy categorisation	Study design & setting	Location	Population	Demographic characteristics	
						Age	Sex
Cullen, 2018 [5]	Soft toothbrushes, Biotene toothpaste, Lanolin lip care, waxed dental floss, salt and baking soda packets, timer for brushing length	Preventive intervention (oral care kits)	Before-after comparison study at a radiation oncology centre	United States	105 adults with HNC receiving radiation therapy with or without chemotherapy	-	-
Beech, 2016 [2]	Pre-radiotherapy dental extractions	Dental procedures	Retrospective data and cross-sectional surveys at two tertiary hospitals in an Australian state capital	Australia	190 patients who had undergone treatment of oropharyngeal cancer with radiotherapy	Over 18	157 (82.6 %) male, 33 (17.3 %) female
Lee, 2021 [18]	Oral health education, fluoride varnish and fluoride mouth rinse	Preventive intervention (supportive education, oral care kits, fluoride application)	Quasi-experimental case-control study at a University Hospital, department of radiation oncology	South Korea	61 patients undergoing radiotherapy for HNC	33–81	36 (59 %) male, 25 (41 %) female
Ma, 2021 [23]	Chat notifications to self-manage symptoms before and after radiation treatment.	Technology-assisted tools	Before-after comparative study in three academic hospitals in New York	United States	84 patients with HNC scheduled to begin radiotherapy	Over 18	-
Peterson, 2024 [32]	Pre-radiation dental assessment, fluoride application, minimising jaw exposure to radiation	Dental procedures, Preventive intervention (fluoride application)	Integration of evidence-based best practices by a multidisciplinary Expert Panel	International team	Adult patients undergoing radiotherapy for cancer	-	-
Watson, 2021 [40]	Pre-radiation tooth-specific dental treatment pathways to prevent osteoradionecrosis	Dental procedures	Clinical guidelines developed by dental oncology experts across Canadian hospitals	Canada	32 dental oncologists	-	-
Yoshida, 2023 [41]	An e-learning program for oral care, provided to pharmacists to learn about oral care interventions in cancer treatment.	Interprofessional collaborations	Multicentre prospective cohort study conducted in multiple hospitals with dental departments	Japan	173 patients with HNC receiving radiotherapy and chemotherapy	Over 20	-
Lin, 2022 [21]	Mobile app for mucositis management including an assessment tool, individualised oral care advice, symptom tracking and a discussion platform.	Technology-assisted tools	Quasi-experimental study with a pre-post design based in the outpatient clinical hospital department	Taiwan	64 patients receiving radiotherapy and chemotherapy	18–65	-
Jiang, 2022 [16]	Supportive program on xerostomia including oral hygiene education, self-care practices, facial and tongue exercises, follow-up and coaching sessions.	Preventive intervention (supportive education)	Randomised controlled trial based in a tertiary hospital	China	79 patients with HNC receiving radiotherapy	Over 18	-
Kubota, 2015 [17]	Oral health care to reduce pain from oral mucositis, including calculus removal, oral hygiene instructions and self-care.	Dental procedures and preventive intervention (supportive education)	Retrospective cohort study based in an Oral and Maxillofacial University Hospital Department	Japan	33 patients with HNC receiving chemotherapy and radiotherapy	46–77	28 (84.8 %) male, 5 (0.15 %) female
Jiang, 2024 [15]	Supportive program including education on oral hygiene, self-care, facial and tongue exercises and coaching sessions.	Preventive intervention (supportive education)	Randomised controlled trial based in a tertiary hospital	China	92 patients with HNC undergoing radiotherapy	Over 18	71 (77.2 %) male, 21 (22.8 %) female
Morais, 2020 [26]	Preventive oral care program and photobiomodulation therapy	Preventive intervention (supportive education), dental procedures	Prospective cohort study based in a hospital	Brazil	61 patients with HNC undergoing radiotherapy and chemotherapy	Mean age 58.6	49 (80.3 %) male, 12 (19.7 %) female
Elad, 2020 [8]	Preventive oral care, anti-inflammatory agents, photobiomodulation, cryotherapy, antimicrobials, anaesthetics and analgesics, growth factors and cytokines to manage mucositis	Preventive intervention (education, oral care, sodium bicarbonate and chlorhexidine use, symptom management)	Clinical guidelines developed by the Multinational Association of Supportive Care in Cancer and International Society for Oral Oncology (MASCC/ISOO)	International team	Systematic review covering evidence from 1197 publications	-	-

tracking and communication tools, and delivered personalised care recommendations. Within two months of use, patients reported reduced pain, milder mucositis, improved nutrition and enhanced quality of life [20]. Despite these advantages, it was also identified that patient engagement declined over time with these interventions due to: treatment fatigue as toxicities accumulate throughout cancer treatment, chat algorithm rigidity, potential inconsistencies in delivered content, believing chatbot utilisation is not required once cancer treatment is complete, and preference for clinician interaction over a chatbot [23].

Within the public dental setting, clinicians have limited capacity to follow-up and providing ongoing support to HNC patients post-radiotherapy due to long waitlists and resource limitations [19,25]. However, it is clear that there is still a need for active clinician involvement and encouragement to sustain participation in such programs. Out-of-hospital virtual care options may be considered as an alternative technology to address this need, or support health professionals (nurses or allied health) can be considered to provide this in-person follow-up support. The effectiveness of these alternatives

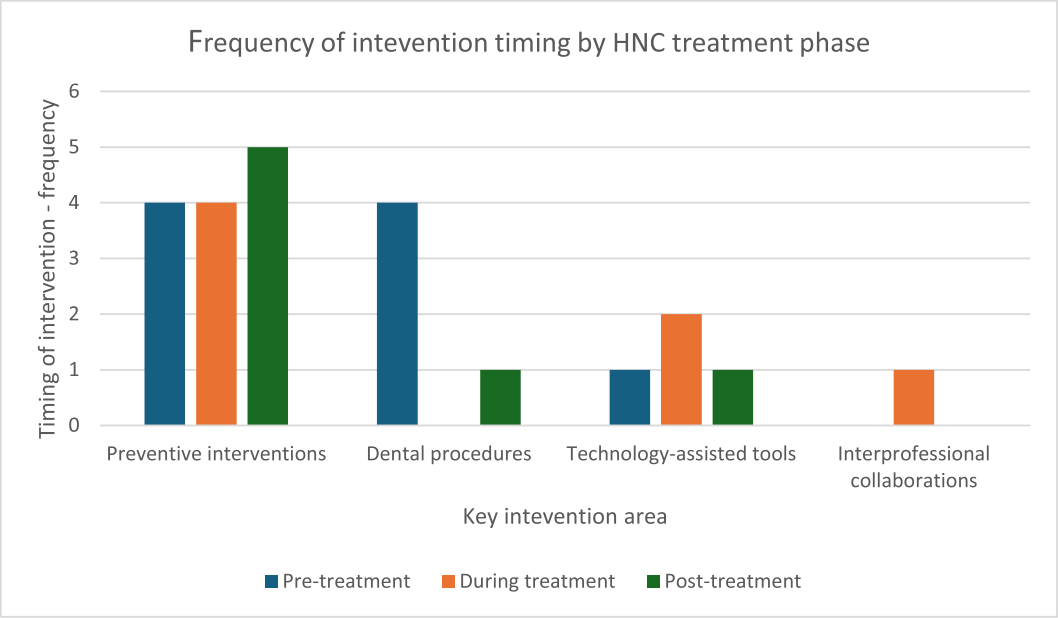

Fig. 2. Distribution of the four key intervention themes by treatment phase frequency.

Table 4
Oral health related outcomes reported in studies by treatment type.

Study	Treatment		Outcomes									
	Radio-therapy	Chemo-therapy	Quality of life	Clinician knowledge/ perceptions	Oral mucositis	Dental caries	Plaque scores	Gingival assessment	Saliva	Osteoradionecrosis	Pain	Nutrition
Cullen, 2018 [5]	X		X	X	X							
Beech, 2016 [2]	X		X									
Lee, 2021 [18]	X		X			X	X	X	X			
Ma, 2021 [23]	X		X	X								
Peterson, 2024 [32]	X		X							X		
Watson, 2021 [40]	X					X		X				
Yoshida, 2023 [41]	X	X			X							
Lin, 2022 [21]	X	X	X		X						X	X
Jiang, 2022 [16]	X								X			
Kubota, 2015 [17]	X	X			X						X	
Jiang, 2024 [15]	X		X			X	X	X				
Morais, 2020 [26]	X		X		X							
Elad, 2020 [8]	X	X			X							

should be investigated in future studies for HNC patients.

The findings from this review additionally highlight the critical role of interprofessional collaboration in improving oral health outcomes for HNC patients. Programs that integrate various healthcare professionals into multidisciplinary care teams, such as dentists, pharmacists and other medical practitioners were more effective at providing timely assessments, preventive care and protective tools such as fluoride splints than more segregated programs [5,41]. An additional benefit identified was improved non-dental clinician awareness of the importance of oral care for patients with HNC. Programs lacking this integration tend to

Table 5
Follow-up time and impacts of oral health management strategies for HNC patients.

Study	Oral health management strategy category	Treatment follow-up duration	Strategy outcomes	Study findings
Cullen, 2018 [5]	Preventive intervention (oral care kits)	Up to 1month post-treatment	1. Patient-reported oral care practices, qualitatively measured 2. Patient perception on oral care rated on a 4-point Likert scale 3. Oral mucositis symptoms rated on an 11-point Likert scale 4. Clinician knowledge and perceptions, qualitatively measured	• Patients with the intervention had better oral hygiene practices, lower severity of oral mucositis, reduced mouth soreness and difficulty swallowing, eating, and talking • Clinician knowledge and perceptions of the importance of oral care improved post-intervention
Beech, 2016 [2]	Dental procedures	3 years post-treatment	1. Oral health related quality of life via an OHIP-14 score (Oral Health Impact Profile) 2. Impact of cancer and cancer treatment on quality of life via FACT-H&N	• Patients who had more than eight pre-radiotherapy dental extractions, or developed osteoradionecrosis, experienced worse oral health-related quality of life • Female gender, p16-negative status, and smoking were associated with poorer quality of life • Excellent dental hygiene was associated with an improved quality of life
Lee, 2021 [18]	Preventive interventions (supportive education, oral care kits, fluoride application)	6 months post-radiotherapy	1. Dental caries experience via DMFT score (decayed and missing teeth) 2. Plaque score (PS) 3. Bleeding on probing score (BOP)) 4. Salivary flow rate 5. Quality of life, assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire H&N35 (EORTC QLQ-H&N35)	• The intervention group had decreased plaque score and bleeding on probing, but salivary flow rate decreased in both groups • Quality of life in the intervention group was significantly better in terms of swallowing, speech, and sexuality scores
Ma, 2021 [23]	Technology-assisted tools	4 months post-radiotherapy	1. Patient-reported symptom data, qualitatively measured via survey 2. Clinician-reported outcomes, qualitatively measured via survey	• 61 % of patients reported that the chatbot helped with symptom self-management and reduced the need to call the care team • Engagement was highest in the first month and declined over time • There was concordance between patient-reported outcomes and clinician-reported outcomes • 89 % of patients found the chatbot easy to use, and it provided valuable support during radiation therapy
Peterson, 2024 [32]	Dental procedures, preventive intervention (fluoride application)	-	1. Osteoradionecrosis incidence, duration and healing 2. Quality of life	• Best practices for prevention of ORN include dental assessment before radiation therapy, fluoride application to prevent post-radiation caries, and reducing the volume of the jaw exposed to high doses of radiation • Management of ORN involves nonsurgical and surgical approaches depending on the severity of the condition • Hyperbaric oxygen therapy is not widely recommended due to limited evidence, and there are mixed results regarding the use of leukocyte- and platelet-rich fibrin for ORN prevention
Watson, 2021 [40]	Dental procedures	-	1. Critical Radiation Threshold – radiation dose above which a clinician makes decisions to prophylactically remove teeth prior to radiotherapy 2. Treatment of teeth with various forms of dental caries and/or periapical lesions 3. Treatment of third molars 4. Treatment of teeth with periodontal disease	The following prophylactic treatments should be considered to: • prevent the occurrence of post-radiation caries: dental assessment, home care instructions, diet counselling, daily fluoride application, regular dental visits, regular cleaning, management of xerostomia, counselling on radiotherapy complications and smoking cessation • prevent further tooth loss and ORN in a patient with periodontal disease: oral hygiene instruction, frequent follow-up/regular cleanings every 3 months, daily fluoride application, management of xerostomia and smoking cessation • prevent the occurrence of oral mucositis: oral rinses, suitable hygiene materials and elimination of potential irritants To avoid ORN: treatment pathway for teeth at risk of osteoradionecrosis was developed; teeth receiving a dose of 70 Gy in the maxilla or 60 Gy in the mandible should be considered for prophylactic extraction, and; at least 7–14 days of healing should be allowed between extraction or other surgical procedures before the commencement of radiotherapy

(*continued on next page*)

Table 5 (*continued*)

Study	Oral health management strategy category	Treatment follow-up duration	Strategy outcomes	Study findings
Yoshida, 2023 [41]	Interprofessional collaborations	-	1. Presence of Grade 2 oral mucositis, via clinical observation and qualitative patient reports of dietary changes due to pain 2. Time to onset of Grade 2 mucositis 3. Presence of Grade 3 mucositis, diagnosed based on severe pain preventing oral intake and requiring intravenous sedation	• The pharmacist intervention group had a lower presence of Grade 2 oral mucositis compared to the control group • The onset of Grade 2 oral mucositis was delayed in the intervention group
Lin, 2022 [21]	Technology-assisted tools	No follow up after treatment cessation	1. Oral mucositis (via the WHO oral toxicity scale) 2. Pain (via the Numeric Rating Scale) 3. Nutrition assessment (using the Patient-Generated Subjective Global Assessment- PG-SGA) 4. Quality of life (using the EORTC quality of life questionnaire)	• The intervention group showed a significantly lower PG-SGA score (indicating better nutritional status) at multiple time points, less severe oral mucositis, and reduced pain
Jiang, 2022 [16]	Preventive intervention (supportive education)	1 year post-radiotherapy	1. Xerostomia severity, via the xerostomia questionnaire and the CTCAE grading scale for adverse events 2. Unstimulated saliva flow rate at various follow-up points	• The intervention group experienced significantly greater relief from xerostomia and a higher unstimulated saliva flow rate compared to the control group at the 12-month follow-up
Kubota, 2015 [17]	Dental procedures and preventive intervention (supportive education)	No follow up post-radiotherapy	1. Opioid dosage, duration of opioid use and length of hospitalisation 2. Pain from mucositis via a visual analog scale	• The intervention group had a significantly lower total dose of opioids and a shorter hospital stay compared to the control • Although duration of opioid use showed a trend toward reduction in the intervention group, it was not statistically significant
Jiang, 2024 [15]	Preventive intervention (supportive education)	12 months post-radiotherapy	1. Plaque index (PI) 2. Gingival index (GI) 3. Caries experience via a DMFT score 4. Oral health-related quality of life via an OHIP-14 score	• The intervention group showed a significantly lower plaque index (PI) and improved OHIP-14 scores • Improvements were also noted in the self-reported state of teeth and gums, although gingival inflammation (GI) did not differ significantly between groups • The difference in DMFT increase between the two groups was not statistically significant
Morais 2020 [26]	Preventive intervention (supportive education), dental procedures	No follow up post-radiotherapy	1. Severity of oral mucositis 2. Quality of life impacts (via OHIP-14 and PROMS scales) 3. Radiotherapy interruptions due to oral mucositis symptoms	• The combined POCP and PBMT were effective in controlling oral mucositis severity, improving quality of life, and reducing radiotherapy interruptions, with only 5 % of patients experiencing treatment delays due to oral mucositis
Elad, 2020 [8]	Preventive intervention (education, oral care, sodium bicarbonate and chlorhexidine use, symptom management)	-	Management methods for mucositis before and during cancer treatment, including: 1. Basic oral care 2. Anti-inflammatory 3. Photobiomodulation (laser and other light therapy) 4. Cryotherapy 5. Antimicrobials, coating agents, anaesthetics and analgesics 6. Growth factors and cytokines 7. Natural and miscellaneous agents 8. All interventions for GI mucositis	• Implementation of multiagent combination oral care protocols is beneficial, although there is limited and inconsistent data to develop a guideline regarding the use of professional oral care, patient education or saline or sodium bicarbonate rinses to prevent oral mucositis in patients with HNC. Chlorhexidine should not be used. • Benzydamine mouthwash should be used for the prevention of oral mucositis • Intraoral photobiomodulaton therapy using low-level laser therapy should be used to prevent oral mucositis, considering individual patient safety • Oral cryotherapy should be used to prevent oral mucositis during some chemotherapy treatments • Topical morphine 0.2 % mouthwash can be used for treatment of oral mucositis-associated pain • Sucralfate is not recommended for prevention of oral mucositis-associated pain • Oral glutamine can be used for prevention of oral mucositis; parenteral glutamine is not recommended. • Honey is suggested for prevention of oral mucositis

rely on external referrals and experience delays and inconsistencies in care [3]. This pattern reflects global challenges, including Australia, where limited interprofessional collaboration contributes to gaps in care delivery. Programs such as education modules for dentists and general practitioners, launched by Head and Neck Cancer Australia (HNCA) in March 2023, exemplify how collaboration could be enhanced by emphasising the involvement of dental professionals within HNC care teams [28].

Lastly, this review gathered information on the timing of different oral health management strategies relative to HNC treatment. Provision of preventive interventions including oral hygiene instruction, facial and tongue exercises before radiotherapy, during treatment at the peak of mucositis severity, immediately after conclusion of radiotherapy and with three- and six-month reviews was found to improve patient outcomes [5,8,18]. Similarly, utilisation of technology-assisted tools across all HNC treatment phases can improve outcomes, however patients

engaged optimally with the intervention during treatment and experienced a decline in engagement after completion of treatment [16,23]. Finally, dental procedures were most effective when carried out prophylactically pre-radiotherapy [17]. As such, an ideal oral health management program would involve pre-radiotherapy patient education and completion of dental procedures to avoid radiotherapy interruptions and minimise incidence of ORN. Supportive education can be provided via technology-assisted tools during radiotherapy treatment to enable self-management of symptoms, for example by providing a mucositis assessment tool and delivering personalised oral care advice accordingly to manage symptoms. This may minimise need for patients to balance regular visitation to a dental professional, regimented HNC treatment timings and fatigue. Use of technology-assisted tools should be encouraged by clinicians even after completion of radiotherapy to help patients manage long-term sequalae of radiotherapy. There is an urgent need for research to establish the evidence for such an oral health management protocol to identify best practice in managing the oral health of patients undergoing cancer treatment.

This review's scoping design allows a broad exploration of oral health strategies, ensuring methodological rigour and reliability. By examining multi-stage interventions, the review provides insights into preventive and rehabilitative strategies, relevant for policy and program planning. The inclusion of diverse study designs enriches the evidence base. The impact on patient quality of life was consistently investigated and offers practical insights for public health planning and addresses gaps in oral health care access for HNC patients.

This review may be subject to language bias, as it only included studies published in English, potentially excluding valuable insights from non-English research. Limiting the search to a 10-year period may have overlooked relevant older studies. Furthermore, due to time constraints, a structured search of grey literature was not conducted, which might have restricted the inclusion of some pertinent information. However, this may have been mitigated through expert consultation. Finally, as the studies did not report on standardised outcome measures for oral health or timings of interventions relative to HNC treatment, comparison of study results was challenging.

5. Conclusions

This review highlights the critical role of comprehensive oral health management strategies for improving health outcomes for patients with HNC. Evidence points to the effectiveness of integrating multiple types of interventions across varying phases of HNC treatment, including education, preventive dental care and innovative tools such as mobile apps. However, the lack of standardised guidelines pertaining to the type and timing of oral health care during HNC treatment as well as current limitations in interprofessional collaboration remain a barrier to efficient and consistent care delivery. Addressing these gaps through multidisciplinary approaches and tailored dental interventions with a focus on patient education is vital to enhance service delivery, patient outcomes and quality of life.

CRediT authorship contribution statement

Saba Shamekhi: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Shalinie King:** Writing – review & editing, Writing – original draft, Methodology, Data curation. **Harsha Chugh:** Writing – review & editing, Writing – original draft, Visualization. **Arash Rudman:** Writing – review & editing, Methodology. **Archana Pradhan:** Writing – review & editing, Methodology. **Sue-Ching Yeoh:** Writing – review & editing, Methodology. **Bradley Christian:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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