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Effectiveness of Oral Symptom Management in Head and Neck Cancer Patients Receiving Concurrent Chemotherapy and Radiation Therapy

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Abstract

The purpose of this study is to understand the management of oral symptoms in patients with head and neck cancer receiving concurrent chemotherapy and radiation therapy in the past 10 years. Keywords Settings" oral cancer or head and neck cancer," symptom management or symptom control or relief or improvement symptom management or symptom control or remission or relief or improvement", "CCRT or concurrent chemoradiotherapy" and oral health or oral hygiene or oral care, A total of 160 articles were searched between January 2014 and December 31, 2024 through PubMed, EBSCOhost, Embase and Airitilibrary. After removing duplications and publications with inconsistency in the themes, 13 publications were included. The study results revealed the efficacy of oral symptom management for head and neck cancer patients during concurrent chemotherapy and radiation therapy. The results can serve as a reference for medical and nursing personnel in developing strategies to manage oral symptoms among families of head and neck cancer patients undergoing concurrent radiation and chemotherapy. These strategies aim to reduce treatment-related discomfort and improve oral comfort during cancer therapy.

Keywords: oral cancer or head and neck cancer, symptom management, CCRT or concurrent chemoradiotherapy

1. Introduction

According to 2020 Global Cancer Statistics, head and neck cancer is the third most common cancer in the world, with 1,464,550 new cases and 487,993 deaths. This accounts for 7.6% of all cancers and 4.8% of all cancer-related deaths (Sung et al., 2021). In head and neck cancer patients receiving concurrent chemotherapy and radiation therapy, both chemotherapeutic drugs and radiation can damage normal cells. Chemotherapy drugs enter the human body through blood vessels, and their effects are systemic. Radiotherapy affects radiated areas, including the skin and mucous membranes of the face, mouth and neck, and muscles and nerves can cause tissue inflammation and mucositis, and subsequent pain can limit a patient's oral functions, such as chewing and swallowing. Poor oral function can reduce food intake and lead to weight loss (Machtay et al., 2008, Li, Chen et al., 2019), especially during the treatment period, according to Wang et al., (2021), the incidence of side effects included pain (97.6%), sticky saliva (92.9%), dry mouth (89.9%), changes in taste (92.9%), difficulty swallowing (87.6%), oral mucositis (81.7%), and chewing difficulty (39.6%), resulting in reduced intake and weight loss, which strongly affected the patient's quality of life and caused psychological problems. Therefore, for prevention or palliative concurrent chemotherapy and radiation therapy-associated side effects of the oral cavity, the existing care guidelines for oral mucositis provide health education references during treatment (Elad et al., 2020). However, are there other management strategies for oral symptoms? Therefore, the purpose of this study was to explore the search for effective management strategies, to compile intervention measures that have been effective in the research results of the past ten years, and to provide a reference for medical personnel and patients to shorten the discomfort period during treatment, reduce the side effects of treatment, and reduce the

physical and psychological impact on individuals.

2. Materials and Methods

A scoping review was performed according to the five steps of Arksey and O'Malley (32): (1) defining the research question; (2) identifying relevant studies; (3) defining the study selection; (4) charting the data; and (5) collecting, summarizing, and reporting the results.

2.1 Defining the Research Question

In the past 10 years, methods for managing oral symptoms or strategies for controlling or alleviating symptoms related to the oral cavity have been the focus of our attention. Since there are already care guidelines for oral mucositis, we searched for head and neck cancer patients in the past 10 years. Effective studies on the management of oral symptoms during the period of receiving concurrent chemotherapy and radiation therapy can provide a complete understanding of oral health, oral hygiene, or oral care. Therefore, the empirical literature search method was used to find answers, and we hope to provide effective preventive measures for medical personnel for clinical reference. The objective of this study was to investigate the effect of oral symptom management in patients with head and neck cancer receiving concurrent chemotherapy and radiation therapy.

2.2 Identifying Relevant Studies

Based on preliminary retrieval, the authors performed the following steps:

2.2.1 The Chinese and English keywords used were “oral cancer or head and neck cancer”, “symptom management or symptom control or remission or relief or improvement”, and “concurrent chemotherapy and radiation therapy (CCRT)”, or concurrent chemoradiotherapy" and oral health or oral hygiene or oral care, the English keywords included the MeSH term.

2.2.2 The selected databases included the PubMed, EBSCOhost and Embase biomedical databases. These databases include high-quality first-hand international journals in the fields of life sciences and medical care, as well as the Chinese database Airitilibrary Huayi online library database, which can provide the studies we were searching for.

2.2.3 Inclusion criteria: Literature data from between January 2014 and December 31, 2024 were searched, and patients with oral cancer or head and neck cancer were identified, clinical studies, randomized assignment studies and meta-analyses related to chemotherapy, concurrent radiation therapy, oral health or oral hygiene, or symptom management or symptom control or remission or improvement of oral care.

2.3 Study Selection

The author used the bibliographic management software EndNote® v.21 for searching. Bibliographic software can compile the data collected from various literature collection channels, such as journals, databases, and the internet, and can manage the literature by classification. When the abstract lacks sufficient information under the present study, complete articles can be comprehensively evaluated to determine their relevance, and the detailed screening process is shown in Figure 1. Comple articles can be screened according to the steps outlined in the PRISMA diagram. After performing a preliminary search, the authors identified 160 articles. After removing 16 duplicate articles, a total of 144 studies might be relevant to the review in this paper. The authors conducted a screening process of titles and abstracts to identify potentially relevant studies. The authors excluded studies including studies on children and adolescents; clinical trials that compared the efficacy of markers; immunization or chemotherapeutic drugs; and radiation therapy modalities. After initial screening, a total of 24 articles seemed possibly relevant to this review. These articles were subsequently retrieved in full-text format for further screening and evaluation. Using the same inclusion criteria, we proceeded to screen the full-text articles. To ensure the reliability and objectivity of the study, the researchers independently reviewed each full-text paper and discussed any differences until a consensus was reached. In the end, after applying the retrieval criteria and conducting a comprehensive review, the reviewers determined that 13 articles met the criteria and were suitable for inclusion in the final review. The data from these academic articles were analyzed.

2.4 Charting the Data

A systematic review and organization of 13 selected studies were performed according to the suggestions of Arksey and O'Malley. We typed relevant information into an Excel sheet, and the categories included author, year of publication, country of publication, study design, management measures, and results. This method was adopted to improve the reliability of the data extraction process. Each selected study was thoroughly reviewed and coded according to our coding template. After we organized and entered the data of the included studies into the form, the two authors shared equal responsibility for data extraction and review. This method is used to

ensure the effectiveness of the extraction program in the scope review.

2.5 Summarizing and Reporting the Results

Microsoft Excel was used to calculate descriptive statistics, present a descriptive overview, and assess the included studies in a standardized manner, thereby facilitating classification, classification, and comparison on the basis of common characteristics, areas of change, and research gaps. After completion, the table was used to present the research results.

3. Results

3.1 Overview of the Characteristics of the Included Studies

A total of 13 articles were included in our comprehensive assessment and review. The main functions and attributes of these articles are outlined in Table 1. Most studies that met the inclusion and exclusion criteria were quantitative studies (n = 13), and most studies were conducted in Asia. There were 5 papers from China, 4 papers from Taiwan, 1 paper from India (n = 10), and 1 paper each from the United States, Iran, and Brazil (n = 3). The publication date ranged from 2014-2023.

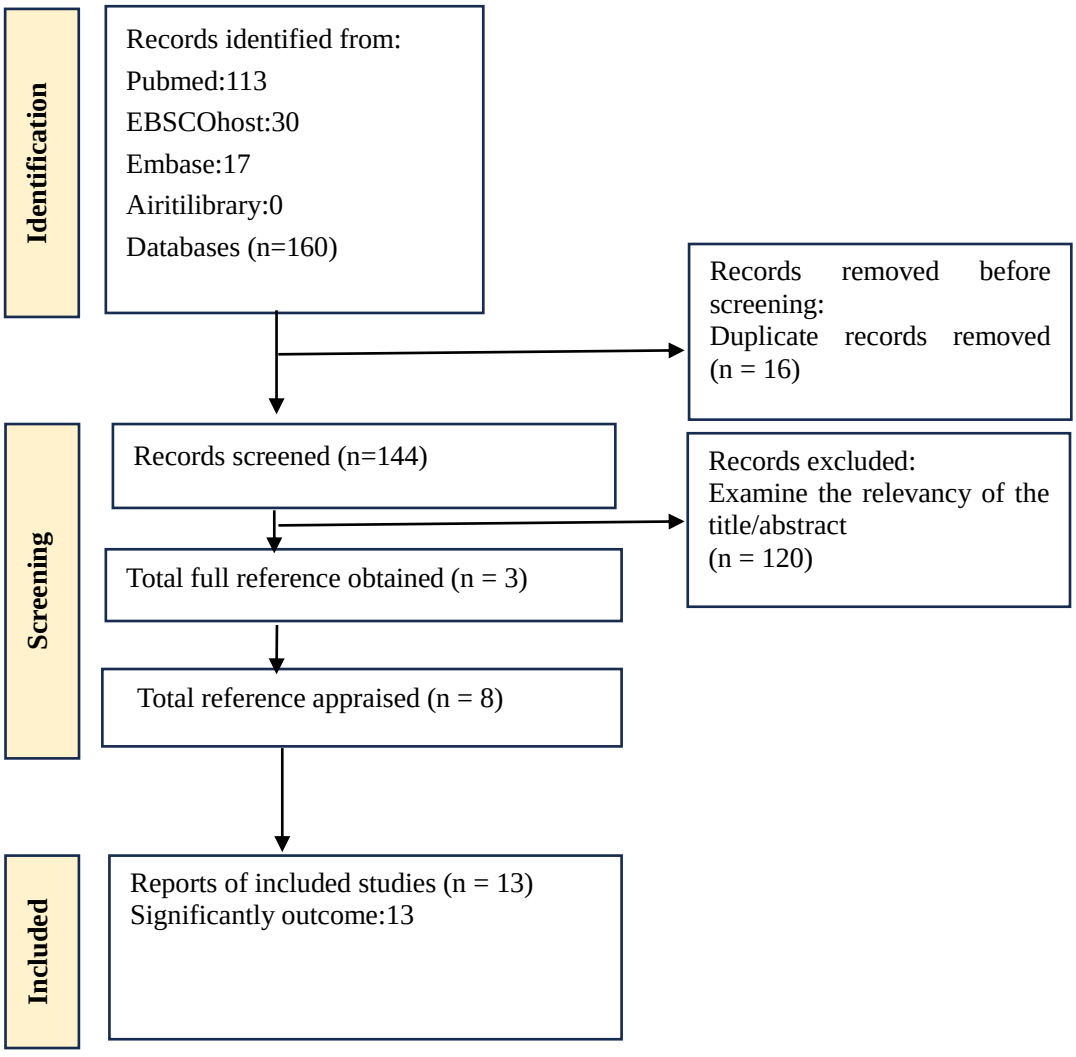

Figure 1. PRISMA 2021 flow diagram (Page et al., 2021)

Table 1. Overview of the characteristics of the included studies (N=13)

Variables	Study ID number	Routine care	Multiple measures
Oral care	1,2,3,4	Yes: 1,2,3	Yes:1,2,3,4
Oral gel	5,6		
Mouthwash	7		
Cognitive behavioral therapy	8		
Home care	9		
Resistance exercise	10		
Nutrition	11,12,13	Yes: 1,2	Yes:1,2

*Lin, Wang et al., (2022) [1]; Lin, Chou et al., (2022) [2] ; Morais et al., (2020) [3]; Huang et al., (2018) [4]; Chin et al., (2023) [5];Allison et al., (2014) [6];Aghamohammadi et al., (2018) [7]; Liu, et al., (2022) [8]; Di et al., (2017) [9]; Hu & Zhao (2021) [10]; Anandhi et al., (2020) [11];Cen et al., (2019) [12] ; Jiang et al., (2019) [13].

Table 2 Study samples (N=13)

ID	Country	Study Design	purposes	Dx	Age	Sample Size	Grading Scale	Duration/Management	Statistical analyses	Results
1	Taiwan	Quasi-experimental (pre-post)	To explore the effectiveness of a mobile app to support oral mucositis care to improve the nutritional status and reduce the occurrence of oral mucositis of patients with HNC undergoing CCRT	HNC	18-65 years	N=64 I:IG (n=32) C:CG (n=32)	1.self-reported questionnaire 2.WHO oral toxicity scale, 3.pain NRS, 4. PG-SGA QoL 5.QLQ-H&N35	1. 2 months 2.standard care and a mobile app education program: 1)Education forum 2)Self-recording 3)mucositis care 4)Discussion platform	GEE	1. PG-SGA score: IG significantly lower at all three time points T1: (P < 0.001), T2: (P < 0.001), T3: (P < 0.001) 2. IG :T1, T3 Weight loss was lower T1 (P < 0.001), T3 (P<0.001) 3. .IG: Hb and albumin decreased less significantly after 2 months. CG: Hb significantly lower at T3 (P < 0.001) IG: albumin significantly higher at T3 (P < 0.001). 4. Oral mucositis grade significantly less at all three time points; IG: OM significantly lower at T1 (P =.004), T2 (P= .002), and T3(P <0.001). NRS: Pain significantly lower levels at T2 and T3. T2 (P = .005) and T3 (P =.004). 5. patients' QoL T3 : IG Significantly higher CG (P < 0.001)
2	Taiwan	Quasi-experimental (double-group)	To evaluate the effect of a simple home-based oral care regimen on oral mucositis.	HNC	≥20 years	N=63 I:IG (n=31) C:CG (n=32)	1.aplaque record (O'Leary et al, 1972) 2.oral assessment guide (OAG)	1.six-to seven-week 2. routine care and two-way interactive home-based oral care regimen. 1) Self-examination 2)The nursing staff checked the subject's execution accuracy and provided assistance every week.	two-way repeated measures ANCOVA	IG : development of mucositis in the traumatic phase was significantly lower than that in the control group (effect of group: F = 11.1, p < .01; effect of group x time: F = 3.5, p = .01).
3	Brazil	prospective observational study (Prospective cohort)	To evaluate the occurrence and severity of oral complications, number of RT interruptions and QoL in a population of HNC cancer patients	HNC	2016/02 -2017/12 till 2018/04 patient assessment and	N=61	1. NCI 2. WHO scale 3. PROMS 4.Xerostomia Inventory (XI) 5.Oral Health Impact Profile	1. throughout the complete RT/CT treatment. 2. Oral preventive care protocol 1) Preventive oral care	Non-parametric Wilcoxon test /Kaplan–Meier and the	1. Oral health conditions was a significant improvement in between initial assessment and the two longitudinal assessments (p < 0.05). 2. OM: 7th RT session 45.9%, and few patients ranked the highest score of OM.

			receiving a preventive oral care program (POCP) and photobiomodulation therapy (PBMT).		data collection was finished		(OHIP-14)	program; POCP 2)photobiomodulation therapy (PBMT).	log-rank test	3. Discontinued RT due to OM occurred in only three patients (5%), and the maximum duration was 10 days. 4. The overall survival rate was 77% and disease-free survival was 73.8%. 5. Lower survival time was observed for patients with no response to RT (p<0.01).
4	Taiwan	RCT	The effectiveness of a saline mouth rinse regimen and education programme on RT- induced oral mucositis and QOL in oral cavity cancer patients	oral cavity cancer	≥20 years	N=91 I:EG (n=48) C:CG (n=43)	1.WHO Oral Toxicity Scale 2.MacDibbs Symptom Score—Modified for oral cavity cancer (MSS-moo) 3.UW- QOL	1. begun 4–8 weeks after the RT or CCRT. 2. a saline mouth rinse regimen and education programme 1) Mouth care skills:normal saline mouth rinses with wet dressing gauze: four times per day, and each saline mouth rinse was 3- 4 hrs after meals. 2) face-to-face patient education, and 3) supportive care.	chi-square test, Fisher's exact test and independent t test. Mixed-model analysis ANOVA	1. EG: A significant group ×time interaction (Fin = 4.114, p < .05), physical function QOL(57.15–69.68) increased significantly more than of the control group (56.90–61.17). 2. EG: A significant group ×time interaction (Fin = 4.627, p < .05) indicated that social-emotional QOL (70.22–78.11) improved more significantly than in the control group (69.37-69.96) after 8 weeks.
5	Taiwan	RCT, Single -Blind	to evaluate the efficacy of polyacrylate silver salt oral gel in improving the symptomatic relief of CCRT-induced oral mucositis and oral dysfunction in HNC patients.	HNC& OM G2	25-70 years	N=24 I:PSS (n=12) C:CG (n=12)	1. (NCI- CTC/ CTCAE V3).	1.T0 and lasted for 4-5 weeks until around 5-10 days of RT completion. 2. polyacrylate silver salt/ polyvinylpyrrolidone-based liquid oral gel 1)Standard oral hygiene 2)gargle with 15 g of PSS oral gel for 1 min after meals and before going to bed.	1.SAS PROC MIXED's mixed model 2. last-observation-carried-forward strategy for intention-to-treat analysis (LOCF-ITT)	PSS: The mean difference in OM grade at T4: 1.21(1.59 vs. 2.8，p < 0.0001). Term-by-Term comparison between groups showed statistically significant difference in all terms except T1 (T2: 2.25 vs. 2.88, p Z 0.0235; T3:1.83 vs.2.91, p < 0.0001 and T4: 1.59 vs. 2.80, p < 0.0001). The decrease of OM grade from T2 to T3 was largest and significant (from 2-3 week after the intervention, and the average number of 25-29 RT fractions)
6	USA	RCT, Double-Blind, placebocontrolled study	to assess the efficacy of a Mucoadhesive Hydrogel (MuGard) in mitigating oral mucositis symptoms in patients being treated with chemoradiation therapy for cancers of the HNC	HNC	≥18 years	N=78 I:MuGard (n=37) C: SC sham-control (SC) (n=41)	1.Oral Mucositis Daily Questionnaire (OMDQ) 2.WHO criteria. 3.Safety data (AEs) were recorded on days of radiation. 4.Mouth and throat soreness (MTS)	1. the first day of radiation and continuing to the last day of radiation therapy (LDRT). 2. to rinse with 5 mL for a full minute and expectorate, 4 times per day. 1)advised to refrain from eating or drinking for 1 hour after dosing. 2)provide supportive therapy as needed. 3)Avoid medications or glutamine and various oral rinse medical devices that increase the risk of	ANOVA, Wilcoxon -Gehan test Fisher's exact test SAS System, version 9.1.3.	1. MuGard effectively mitigated OM symptoms as reflected by area under the curve of daily patient-reported oral soreness (P=.034) and WHO scores on the last day of radiation therapy (P=.038). 2. AUC for OMDQ Q2 was 86.1 for SC, it was 68.0 for MuGard-treated individuals (P =.034, ANOVA). LS Mean AUC for the MuGard cohort (86.5) was superior to SC (103.3; P=.046, ANOVA).

								OM		
7	Iran	RCT, Double-Blind (using the balance block method) divided into two groups	To evaluate the effectiveness of Zataria multiflora (ZM) extract mouthwash in the prevention and reduction of OM related to local radiotherapy in the treatment of HNC patients.	HNC	18-70 years	N=52 I:IG (ZM group) (n=25) C:CG (n=27)	1.World Health Organization (WHO) mucositis scale 2.Oral Mucositis Assessment Scale (OMAS). 3.visual analog scale (VAS) for pain	1. the first day of radiation and continuing to the last day of radiation therapy (LDRT) until 7 weeks after the conclusion of the treatment. 2.Zataria multiflora (ZM) extract mouthwash 1)gargle the mouthwash 5 mL for 1 min, three times a day (after breakfast, after lunch, and before bedtime after brushing) and also once half an hour before each radiotherapy session. 2) not to wash their mouth with water for up to an hour, to avoid eating or drinking and to mark the time on the record form, and not to smoke or to eat spicy, hot, or very cold foods 3. The taste, smell, and shape of the ZM and placebo mouthwash were the same in this double-blind study.	chi-squared test, Mann-Whitney U test, and Fisher exact test Kolomogrov Smirnov (KS)	1. The OM intensity trends in the ZM group during these weeks of treatment were detected 3.152 times less frequently than in the placebo group. 2. The incidence of grades 3–4 OM was detected in the ZM group compared to the placebo (24 versus 55.5%). 3. The use of the ZM mouthwash affected the incidence of grades 3–4 OM to a relative risk ratio of 0.432 (95% confidence interval [CI] 0.199-0.938). 4. The mean pain score at week 6 was 2.77 ± 2.59 in the placebo group. and 0.92 ±2.17 in the ZM group. 5. OMAS mean scores in week 6 10.00±8.45 versus ZM group 4.96 ±7.85, and a twofold(50%) decrease. 6. The mean of the WHO scores in week 6 was 2.03±1.31 in the placebo group compared to 1.28 ±1.27 in the ZM group, and a twofold decrease was observed in the WHO scores of the ZM group.
8	China Hunan	RCT	To determine whether cognitive behavioral therapy (CBT) could help prevent oral mucositis during chemoradiation therapy for locoregional advanced nasopharyngeal carcinoma (LA-NPC).	LA-NPC	18-70 years	N=277 I:IG (CBT) (n=138) C:CG (TAU) (n=139)	1. NCI/ CTCAE V 5.0 2.Hospital Anxiety and Depression Scale (HADS) 3.symptoms of anxiety (HADS-A) and depression (HADS-D) Response Evaluation Criteria in Solid Tumors (version 1.1)	1. once a week in 45 minutes sessions for 6 weeks during CCRT. 2.Treatment as usual(oral health guidance and education) and CBT sessions were the same (Liu et al., 2021) 1) Week 1 Introduction and establishment of a therapeutic relationship 2) Week 2: Understand the relationships among thoughts, emotions (depression and anxiety) and behavior… 3) Week 3-5 Cognitive restructuring 4) Week 6	Kaplan-Meier method. Cox proportional hazards model way analysis of variance and Fisher's exact test independent samples t-test	1. The incidence of oral mucositis was significantly lower in the CBT group (84.8%; 95% confidence interval [CI], 78.7%-90.9%) than in the TAU group (98.6%; 95% CI, 96.6%-100%; P<0.001). 2. The median latency period was 26 days and 15 days in the CBT and TAU groups, respectively (hazard ratio, 0.16; 95% CI, 0.12-0.22; P<0.001). CBT significantly reduced ≥ grade 3 oral mucositis (71.9% vs. 22.5%, P<0.001), dry mouth (10.8% vs. 3.7%, P=0.021), dysphagia (18% vs. 5.1%, P=0.001), and oral pain (10% vs. 3.6%, P=0.034) compared with TAU.

								Consolidating the experiences of dealing with emotional problems 3. TAU consists of irregular intervals of educational sessions that include information on health, nutrition, and psychology and provides explanations tailored to the patient or family's problems.		
9	China	RCT	To investigate the internal effect of smart-phone application on development compliments of CCRT therapy in patients with NPC after discharging	NPC	2015 -2016	N=65 I:IG (n=32) C:CG (n=33)	1.EORTC QLQ-C30 2.Global Quality of Life Scale (GQL)	1. From discharge and 6 months after discharge. 2.The mobile medical APP: collects patients' records of side effects, complications and quality of life at the time of discharge and within 6 months after discharge. 1) a follow-up visit, 2) a knowledge base 3)interaction.	independent samples t-test	1. IG: After discharge 6 months, the incidence of oral music, dry mouth, nasal objection and difficulty in opening mouth of intervention group were lower than control group significantly ($p<0.05$), 2. IG: The quality of life of intervention group higher than control group significant ($P < 0.05$). Except for social function (SF), the scores of all functional areas in the experimental group were higher than those in the control group ($p<0.05$). Except for nausea and vomiting (NV), dyspnea (DY), sleep disorder (SL), constipation (CO), cholesterol (DI), and financial difficulties (FI), the scores of all symptom areas in the experimental group were lower than those in the control group, reaching statistical significance ($p<0.05$).
10	China Jiangsu	RCT	to investigate effects of resistance exercise on complications, cancer-related fatigue and quality of life in nasopharyngeal carcinoma patients undergoing chemoradiotherapy	NPC	18-70 years	N=132 I:IG (n=67) Resistance exercise C:CG (n=65) Relaxation control	1.MFSI-SF scoring System 2.EORTC QLQ-30 form(version 3.0 3.global quality of life score	1. Each exercise lasted 60 minutes, twice a week for 12 weeks. 2. Resistance exercise 1) eight machine based progressive resistance exercises. 3.Relaxation control consisted of progressive muscle relaxation exercises without any aerobic or muscle strengthening exercise.	SAS (v9.3) ANCOVA unpaired Student's t test or Mann Whitney test, Fisher's exact test chi-square test two-way ANOVA Tukey's multiple comparisons test	Compare alleviation of all complications: p ($p < 0.05$ for all complications) at 12 weeks after discharge. CG/IG : 1. The percentage of III–IV grade oral mucositis (32.3% to 10.8% vs 35.8% to 6.0%). 2. Mouth-opening difficulties (12.3% to 6.2% vs 13.4% to 2.9%). 3. Nasal congestion (29.2% to15.4% vs 25.4 % to 10.5%. 4. Hearing loss (73.9% to 63.1% vs77.6% to 44.8%). 5. Significantly higher scores were observed in the resistance exercise group at 12-week post-discharge in terms of global quality of life (73.7±11.8 vs.64.2 ±12.6, p=0.042), Physical function (74.2±13.8 vs. 65.9 ±12.1, p=0.031), social function (72.8±12.4 vs. 64.2 ±11.7, p=0.046) and role function (78.5±12.8 vs 67.2±10.3, p = 0.022)
11	India	RCT, Double-Blind	to determine the effect of zinc supplementation on radiation- induced oropharyngeal	Stage III and IV-A oropharynx and	<70 years	N=120 I:IG (n=60) C:CG (n=60)	1.Radiotherapy Oncology Group scoring criteria for acute radiation toxicity	1. during the entire course of CCRT and continued till 2 weeks after treatment. 2. oral zinc sulfate 150	1.Chi-square test 2. Pearson correlation	1. Grade II and Grade III mucositis occurred faster in the placebo group than in the experimental group (P = 0.001). 2. CG: 12 patients (10%) had Grade IV mucositis, enforcing absolute treatment

			mucositis in Stage III and IV-A oropharynx and hypopharynx cancers treated by hyperfractionated accelerated concomitant boost RT with weakly cisplatin.	hypopharynx cancers				mg once daily. 3. control group patients were given placebo. placebo tablets with similar color and odorless.	3.Friedman test	break for a week.
12	China	RCT	To explore the nutritional intervention process based on PG-SGA, and to evaluate the effect of individualized nutrition intervention on improving the nutritional status of patients with NPC undergoing CCRT	NPC	18-70 years	N=145 I:IG (n=72) C:CG (n=73)	1.PG-SGA 2.RTOG	1.During CCRT (T0, 15 th RT, 30 th RT) 2. routine care and individualized nutritional intervention 1) individualized nutritional education on the basis of the PG-SGA score results, the degree of oral mucositis, and the patient's age, weight, and height to guide patients on the side effects of chemoradiotherapy. and preventive measures. 3. control group: routine nutrition education and dietary guidance.	independent samples t-test	1. The PG-SGA scores: CG/IG (12.15 ±5.08 vs 7.33 ±3.05) points in 15 times of radiotherapy, (20.31 ±6. 01 vs 12.33 ±5. 28) points in 30 times of radiotherapy. 2. The differences between the two groups were statistically significant (P<0. 05). 3. There were all significant differences in no appetite, nausea, vomiting, pain, the degree of radioactive oral cavity mucositis reaction, hemoglobin and serum pre-albumin levels (P<0. 05) between 15 times and 30 times of the radiotherapy.
13	China	RCT, Double-Blind, PlaceboControlled Trial	to evaluate the effect of a probiotic combination on the severity of oral mucositis	NPC	18-70 years	N=99 I:IG (n=64) C:CG (n=35)	National Cancer Institute's Common Terminology Criteria for Adverse Events (version 4.0)	1. beginning to the end of treatment for up to 7 weeks. 2. The probiotic combination (Bifico,SHANGHAI SINE PHARMACEUTICAL CO.LTD1) 3 capsules 2 times a day. 3. placebo: The shape and color of the placebo as well as other properties were devised according to the standards of the Chinese Pharmacopoeia to be identical to those of the probiotic combination.	Fisher exact test FLASH UPARSE operational taxonomic unit (OTU) and UPARSE-OUT reference algorithms in the UPARSE software Ribosomal Database Project classifier and the unweighted UniFrac distance	CG/IG : 1. The incidences of grade 0, 1, 2, and 3 OM, respectively. (0% and 12.07%, 0% and 55.17%, 54.29% and 17.24%, and 45.71% and 15.52%.) 2. CG: markedly lowered the reduction rates of CD4+ T cells (76.59% vs 52.85%; P < .05), CD8+ T cells (62.94% vs 29.76%; P < .05), and CD3+ T cells (69.72% vs 45.49%; P < .05) in an A-CCRT-P (after treatment with radiotherapy plus chemotherapy plus the probiotic combination) group.

*Lin, Wang et al., (2022) [1]; Lin, Chou et al., (2022) [2] ; Morais et al., (2020) [3]; Huang et al., (2018) [4]; Chin et al., (2023) [5];Allison et al., (2014) [6];Aghamohammadi et al., (2018) [7]; Liu, et al., (2022) [8]; Di et al., (2017) [9]; Hu & Zhao (2021) [10]; Anandhi et al., (2020) [11];Cen et al., (2019) [12] ; Jiang et al., (2019) [13].

3.2 Study Samples

The research results of 13 publications were effective, including oral care-related 4 papers, 1 paper related to mouthwash, 2 papers related to oral gel, 3 papers related to nutrition, and one paper each related to cognitive behavioral therapy, resistance exercise, and home health education guidance. The study subjects were 6 papers on head and neck cancer, 5 papers on nasopharyngeal carcinoma, and one paper each on oral cancer and oropharyngeal/hypopharyngeal cancer. The age range of the admissions was between 18 and 70 years (see Table 2).

4. Discussion

Among the management measures provided, one article used a mobile application APP to improve oral mucositis, pain perception scores, nutritional status and quality of life in patients with head and neck cancer receiving CCRT Lin, Wang et al., (2022), and patients with nasopharyngeal cancer receiving CCRT were able to have correct nursing measures and methods to alleviate their symptoms, reduce anxiety, and effectively self-manage and adjust to reduce adverse reactions and complications caused by treatment (Di & Li, 2018).

5. Conclusion

Several limitations were identified across the studies reviewed. Geographically, the studies were primarily conducted in Asian countries (10 studies: articles 1, 2, 4, 5, 8, 9, 10, 11, 12, and 13), with only one study from the United States and none from European countries, which may limit the generalizability of the findings across diverse populations. Sample sizes were often small, reducing statistical power. For instance, in study (5), only 12 participants were included in each of the experimental and control groups, limiting the extrapolation of the results.The intervention methods were not consistently well-defined. In some cases, such as cognitive-behavioral therapy studies, readers had to refer to prior publications by the same authors to understand the intervention details. Most of the studies employed randomized designs (9 studies: 5, 6, 7, 8, 9, 10, 11, 12, and 13), with four of them (5, 6, 7, and 13) incorporating blinding procedures. Several studies (1, 2, 3, and 4) used multimodal interventions, combining two or more approaches, which complicates the attribution of outcomes to specific components.The intervention durations typically ranged from 6 to 8 weeks, particularly in studies involving patients with nasopharyngeal carcinoma, aligning with the timing of radiotherapy treatments. Resistance exercise programs were generally longer, lasting up to 12 weeks. The longest follow-up duration observed was six months post-discharge. Common oral assessment tools included the Oral Assessment Guide (OAG), World Health Organization (WHO) scale, and Common Terminology Criteria for Adverse Events (CTCAE). Future research should aim to include a more diverse international sample, particularly incorporating European and Australian populations. Studies should also recruit larger participant samples and consider multi-center designs to enhance external validity. Furthermore, the article has not yet performed a statistical synthesis of the included studies. If future studies yield consistent intervention effects, conducting a meta-analysis would be recommended to strengthen the evidence base. In conclusion, this article provides an effective management strategy for oral symptom management during chemotherapy and concurrent radiotherapy for head and neck cancer patients to prevent, reduce or alleviate the side effects of oral symptoms. Our findings can provide medical staff with guidance for patients or their families in clinical or home care, shorten the discomfort and psychological stress during treatment, and even avoid treatment interruptions and complete the cancer treatment plan. It is recommended that medical staff can provide appropriate health education based on the actual situation of the patient, and use a variety of measures to help patients maintain a certain quality of life.

6. Implications for Nursing and Health Policy

There is a need for effective strategies to manage oral symptoms in patients with head and neck cancer receiving concurrent chemotherapy and radiotherapy that take into account individual differences. Here are some suggestions: (a) understand the patient's oral symptoms and related problems; (b) understand the patient's experience with the strategies they have used; (c) understand information and communication skills, such as using mobile apps; (d) understand whether the patient's financial situation is sufficient to afford products that require out-of-pocket expenses; (e) educate medical staff on effective measures for oral symptom management. Implementation of these measures could provide more personalized symptom management education to patients with head and neck cancer who receive concurrent chemotherapy and radiation therapy.

Author Contributions

YHH conceptualized the study, designed the study, conducted a quality check, and wrote the first draft of the manuscript. HRL conceptualized the study, designed the study, conducted a quality check, provided critical feedback and edited the manuscript. Final manuscript

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Conflicting Interests

None.

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