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INTERVENÇÕES NO CONTROLO DA XEROSTOMIA NA PESSOA EM SITUAÇÃO PALIATIVA – SCOPING REVIEW  
INTERVENTIONS IN THE CONTROL OF XEROSTOMIA IN THE PERSON IN PALLIATIVE SITUATION – SCOPING REVIEW  
INTERVENCIONES EN EL CONTROL DE LA XEROSTOMIA EN PERSONA EN SITUACIÓN PALIATIVA - REVISIÓN DE ALCANCE

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## RESUMO

**Introdução:** Xerostomia é a sensação subjetiva de boca seca, ocorre quando menos saliva é segregada do que a quantidade de água perdida por evaporação e por absorção da mucosa oral. Tem múltiplas consequências para a saúde geral e oral das pessoas em situação paliativa, bem como para a qualidade de vida.

**Objetivo:** Examinar e mapear as intervenções implementadas para aliviar a xerostomia da pessoa em situação paliativa.

**Métodos:** Scoping review de acordo com as etapas previstas pelo Joanna Briggs Institute. As bases de dados utilizadas para pesquisa foram: CINAHL COMPLETE®, PUBMED®, MEDLINE COMPLETE®, SCOPUS® e SciELO®.

**Resultados:** Identificados 707 artigos e incluídos 19 na análise final. Esta revisão, considerou os estudos focados em pessoas com doença crónica avançada e irreversível, em situação paliativa e fim de vida, com 18 anos ou mais. As intervenções para o controlo da xerostomia são do tipo: não farmacológicas, avaliação da cavidade oral, acupuntura, substitutos da saliva, estimulantes da saliva e programas educação de higiene oral; e farmacológicas, os parassimpaticomiméticos: pilocarpina e cloreto de betanecol.

**Conclusão:** A xerostomia é uma condição de saúde que pode causar constrangimento social e desconforto crónico, com grande impacto na qualidade de vida das pessoas. Agrupar as evidências disponíveis, dentro desta temática, pode contribuir para que os profissionais de saúde as incorporem na prática assistencial, contribuindo para um aumento da qualidade de vida da pessoa e alívio do sofrimento.

**Palavras-chave:** xerostomia; boca seca; cuidados paliativos; intervenções

## ABSTRACT

**Introduction:** Xerostomia is the subjective sensation of dry mouth; it occurs when less saliva is secreted than the amount of water lost through evaporation and absorption from the oral mucosa. It has multiple consequences for the general and oral health of people in a palliative situation, and quality of life.

**Objective:** To examine and map the interventions implemented to relieve xerostomia of the person in palliative situation.

**Methods:** A scoping review was conducted following the Joanna Briggs Institute methodology. Data search was performed in the following databases: CINAHL COMPLETE®, PUBMED®, MEDLINE COMPLETE®, SCOPUS® and SciELO®.

**Results:** A total of 707 articles were identified, and 19 were extracted for final analysis. This scoping review considered the studies focused on people with advanced and irreversible chronic disease, in a palliative situation and at the end of life, aged 18 years or more. Interventions for the control of xerostomia are: non-pharmacological, assessment of the oral cavity, acupuncture, saliva substitutes, saliva stimulants and oral hygiene education programmes; pharmacological parasympathomimetic: pilocarpine and bethanechol chloride.

**Conclusion:** Xerostomia is a health condition that can cause social embarrassment and chronic discomfort, with a great impact on people's quality of life. Grouping the available evidence, within this theme, can help health professionals to incorporate it into care practice, contributing to the increase in the person's quality of life and the relief of suffering.

**Keywords:** xerostomia; dry mouth; palliative care; interventions

## RESUMEN

**Introducción:** La xerostomía es la sensación subjetiva de boca seca, ocurre cuando se secreta menos saliva que la cantidad de agua perdida por evaporación y absorción de la mucosa ora. Tiene múltiples consecuencias para la salud general y bucal de las personas en situaciones paliativas, y calidad de vida.

**Objetivo:** Examinar y mapear las intervenciones implementadas para aliviar la xerostomia de la persona en condiciones paliativas.

**Métodos:** Revisión del alcance de acuerdo con los pasos proporcionados por el Instituto Joanna Briggs. Las bases de datos para la investigación fueron: CINAHL COMPLETE®, PUBMED®, MEDLINE COMPLETE®, SCOPUS® y SciELO®

**Resultados:** Se identificaron 707 artículos, 19 de ellos para el análisis final. Esta revisión consideró los estudios centrados en personas con enfermedad crónica avanzada e irreversible, en situación paliativa y al final de la vida, de 18 años más. Las intervenciones para el control de la xerostomía son: no farmacológicas, evaluación de la cavidad oral, acupuntura, sustitutos de la saliva, estimulantes de la saliva y programas de educación en higiene bucal; parasimpaticomiméticos farmacológicos: pilocarpina y cloruro de betanecol.

**Conclusión:** La xerostomía es una condición de salud que puede causar vergüenza social y malestar crónico, con un gran impacto en la calidad de vida de las personas. Agrupar la evidencia disponible, dentro de esta temática, puede ayudar a los profesionales de la salud a incorporarla a la práctica asistencial, contribuyendo al aumento de la calidad de vida de la persona y al alivio del sufrimiento.

**Palabras Clave:** xerostomía; boca seca; cuidados paliativos; intervenciones

## INTRODUCTION

According to the Worldwide Hospice Palliative Care Alliance (WHPCA), palliative care is a health policy priority. It is health care, coordinated and global. Its main objective is to promote the quality of life, the development of human well-being and maximize the dignity of care. They help the person with an advanced and incurable chronic illness to live and reduce suffering in extreme end-of-life circumstances. They promote person- and family-centred care. They are provided by multidisciplinary units and teams and in inpatient units or at home (WHO, 2014). It promotes the relief of pain and other disruptive symptoms, affirms life and views death as a natural process. Palliative care integrates the psychological and spiritual aspects of the person in the care process, helping the patient to live as actively as possible until death. They use a multidisciplinary approach to meet the needs of the person and family, including follow-up in bereavement. They encourage quality of life and positively impact the course of the disease, with an early intervention and a systematic assessment of the person in a palliative situation. That combines treatments that aim to prolong life, and when needed, exams to better understand and treat the person's problems (WHPCA, 2020). The strict control of the various symptoms that the person in a palliative situation presents is one of the supporting pillars of palliative care. This is ensured by the rigorous assessment of the symptoms' triggering effects (Twycross, 2020). Xerostomia is the subjective sensation of dry mouth reported by patients. It is considered a symptom of various pathologies, and may also be a consequence of treatments and changes in salivary gland function (De Luca & Roselló, 2014). Xerostomia, is illustrated in the literature as a triggering factor of changes and transformations at various levels (Mercadante et al., 2015). The impact of this problem on the person in a palliative situation interferes with the physical, psychological, emotional and social capacities, conditioning quality of life and even dignity (Fischer et al., 2014). The prevalence of xerostomia ranges from 78% to 88%, being one of the most frequent patients reported symptoms (Lourenço, 2017). Xerostomia is the third most frequent symptom in palliative care, when excluding pain (Al-Shahri et al., 2012). It has a multifactorial aetiology and sometimes it is a very complex symptom to resolve. Identifying it makes it important to assess the oral cavity, use appropriate diagnostic tools and apply effective therapeutic approaches (Al-Shahri et al., 2012). Aetiological factors can be divided into four major groups: iatrogenic, organic diseases, functional causes and psychogenic causes. The iatrogenic causes include head and neck radiotherapy, the use of cytostatics, bone marrow transplantation, smoking, alcohol consumption and the use of drugs (Plemons et al., 2014). With regard to the causes of organic origin, there are also multiple situations that are conducive to the existence of xerostomia, among which rheumatoid arthritis, systemic lupus erythematosus, scleroderma type 1 and 2 diabetes mellitus, sarcoidosis, HIV, primary biliary cirrhosis, hepatitis C, thyroid diseases, amyloidosis, iron accumulation diseases (thalassaemia), infectious diseases (parotitis), cystic fibrosis, among others (Montgomery-Cranny et al., 2014; Mortazavi et al., 2014). Functional causes are also relevant, such as dehydration or inadequate fluid intake, diarrhoea and persistent vomiting, protein deficiencies, cardiac disorders, oedema and malnutrition (De Luca, & Roselló, 2014). The aetiology of xerostomia should also include other physiological causes, mouth breathing, and psychological causes, such as anxiety, stress and depression, which are also triggering factors of this symptom (Montgomery-Cranny et al., 2014). The decrease in the quantity and quality of saliva predisposes to the appearance of lesions of varying severity in the mouth. Due to their difficulty in speaking, halitosis and pain due to dry mucous membranes, patients often avoid social contacts and many of them isolate themselves, which negatively interferes with their quality of life. The mouth is an important and complex organ of the body, with physiological and psychological significance, which allows people to interact between their inner and outer worlds. It is through the mouth that we can perform some of the most important functions of our entire existence, such as eating or verbal communication. Caring for the patient's mouth is a basic intervention of health professionals, especially nurses. They are responsible for managing the aspects related to the provision of this type of care, either directly by providing oral care, or indirectly through the teaching provided to patients and families, or the promotion of self-care. Caring for the mouth of the person in a palliative situation requires various skills which include assessing the condition of the mouth, early recognition of changes, and planning and implementing interventions aimed at solving and/or minimising these problems. This care goes beyond the physical dimension. It can be considered a global care that seeks, together with all other interventions, to promote the dignity of the person in need of palliative care through unconditional respect. Nevertheless, evidence shows that although nurses, for example, recognize the importance of the person's oral cavity care in a palliative situation, they attribute little relevance to it, underlying the lack of knowledge about the subject (Lourenço, 2017). This scoping review was guided by the methodology proposed by the Joanna Briggs Institute (JBI) for scoping review assessments (Peters, et al., 2020). In this respect, and as recommended by the JBI, preliminary research on MEDLINE, CINAHL and the JBI Database of Systematic Reviews and Implementation Reports, was conducted, allowing to verify that there was no scoping review record on the subject. The main objective was to systematically examine and map the research conducted on the interventions used to control xerostomia in palliative care. The reason is that xerostomia is described as a symptom, which is uncomfortable and implies various changes in the quality of life of patients, and because of that, it is imperative to map the existing evidences on the subject, thus giving the possibility of knowledge and understanding to health professionals who want to make a difference in intervening effectively in symptomatology relief. This mapping also allows us to identify relevant questions that help advance the evidence-based health system, increase knowledge, identify gaps, and inform systematic reviews.

## 1. METHODS

The research is orientated by the methodology proposed by the JBI for the Scoping Revision (Peters, et al., 2020) It was written, based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Systematic Review Protocols- Scoping Reviews Extension (PRISMA-ScR) (Tricco et al., 2018). A research protocol was developed with inclusion and exclusion criteria, related to the review and revision issue, and the research limiters.

Review question/objectives: More specifically, the revision was guided by the following questions:

- i-What are the used interventions in the xerostomia control of the patient in a palliative situation?
- ii-What are the characteristics (intervention and duration type) of those interventions?
- iii-What is the specific health professional area that performs those interventions?

### 1.1 Inclusion criteria

As for the participants, this scoping review considered studies focused on patients with advanced and irreversible disease and in palliative situations aged 18 years or older. A person in a palliative situation, due to incurability and disease progression, is subject to physical, psychological and social suffering as well as spiritual (WHPCA, 2020).

Concept: This scoping review considered the studies that address the implemented interventions on controlling xerostomia, dry mouth and salivary gland dysfunction. It was considered non-pharmacological and pharmacological interventions.

### 1.2 Context

This review considered the studies that address the interventions for the xerostomia control in the context of advanced chronic disease and/or palliative and end-of-life care.

Sources: This scoping review considered quantitative studies and systematic reviews. Included quantitative studies are experimental (including controlled randomized trials or quasi-experimental studies) as well as observational designs (cohort and cross-sectional studies).

### 1.3 Research strategy

A three-stage search strategy was used. An initial search limited to MEDLINE Complete<sup>®</sup>; CINALH Complete<sup>®</sup>, PUBMED, SCOPUS. This is followed by an analysis of subject words contained in the title, in the abstract and, in index terms used to describe the articles. In the second stage, the search was replicated, using keywords and subject descriptors identified. In the third stage were examined the bibliographic references of the eligible articles so that it was possible to identify the additional studies. Included in this review were published studies in English and Portuguese regardless of the year of publication. The Mendeley software was used to manage the bibliographic references. The search was made through a Boolean language and by Boolean operators as AND (conjunction) and OR (disjunction) for the descriptors combination. According to the same language and, following mathematical logic, it was also used parentheses (to indicate which part of the research should be carried out first) and inverted commas (to indicate compound terms). The search was conducted in 26 February 2021. The Boolean sentences used on the research were: TI (((MH "Hospice and Palliative Nursing")) OR (MH "Palliative Care") OR (MH "Terminally Ill Patients") OR "end-of-life care" OR "Palliative Medicine" OR ((MH "Hospice and Palliative Nurses Association")) OR (MH "Hospice Care") OR (MH "Terminal Care") OR "Palliative" OR "end of life" OR (MH "Hospices")) OR AB (((MH "Hospice and Palliative Nursing")) OR (MH "Palliative Care") OR (MH "Terminally Ill Patients") OR "end-of-life care" OR "Palliative Medicine" OR ((MH "Hospice and Palliative Nurses Association")) OR (MH "Hospice Care") OR (MH "Terminal Care") OR "Palliative" OR "end of life" OR (MH "Hospices"))) AND (TI ((MH "Xerostomia") OR "dry mouth" OR "Salivary Flow" OR "Oral dryness") OR AB ((MH "Xerostomia") OR "dry mouth" OR "Salivary Flow" OR "Oral dryness"));

### 1.4 Study selection and data extraction

The study selection and data extraction were carried out by two independent authors and the possible differences between them were solved by consensus by a third author with the aim of confirming the eligibility of publications. To facilitate the process, the Rayyan QCRI<sup>®</sup> (Web Systematic Reviews) platform was used in the first stages of publication selection.

## 2. RESULTS

The full text articles were read and analysed by three independent researchers. About 19 articles met the inclusion criteria. The study selection process is according to the PRISMA diagram and is represented in Fig.1 (available at <http://prismastatement.org/prismastatement/flowdiagram.aspx>)

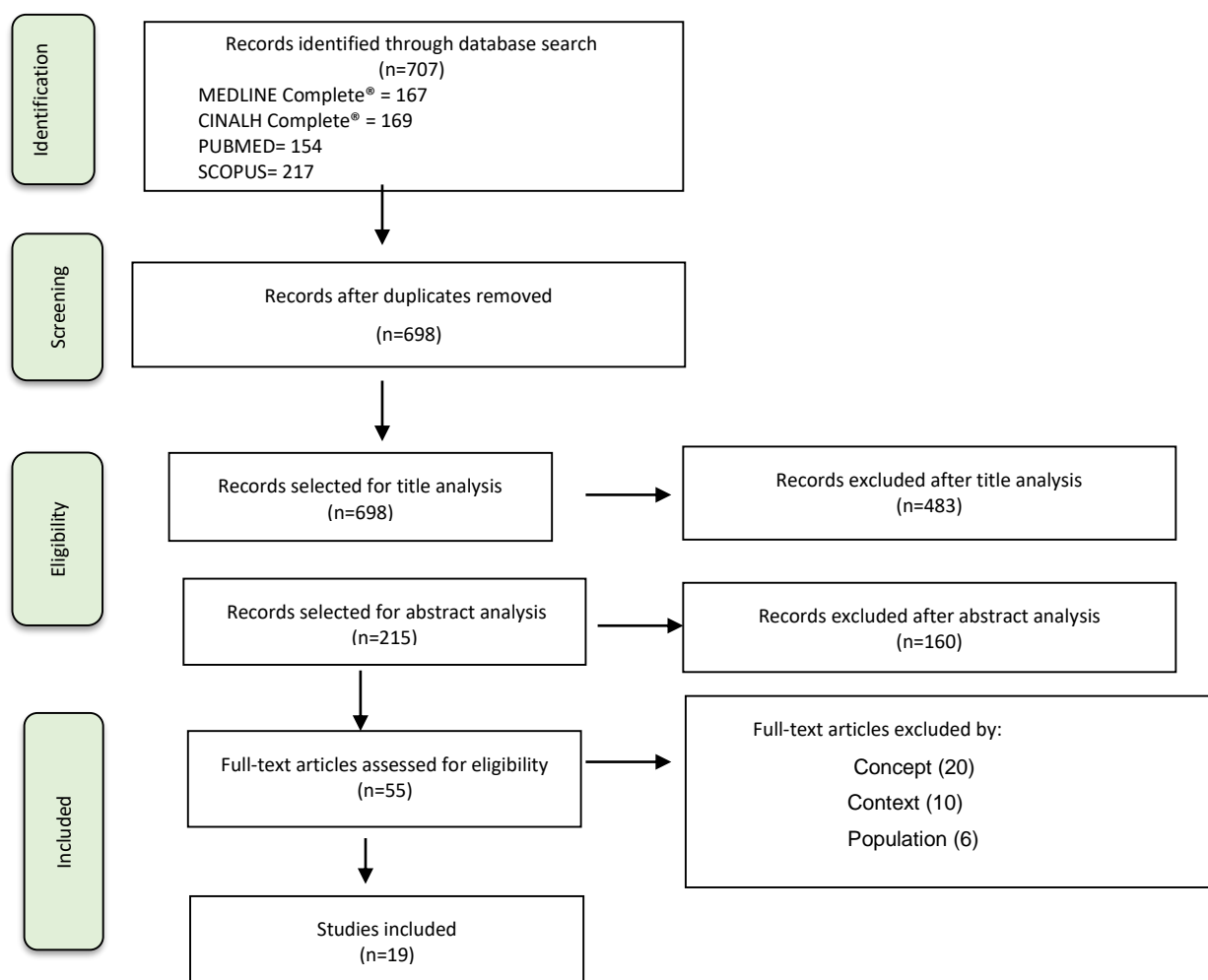


Figure 1 - PRISMA flowchart of the study selection and inclusion process (according Moher, 2009)

The extracted data from the 19 included studies for this revision were organized in two charts according to JBI (2020). The included study information was summarized, regarding the authors, year of publication, originating country, subject study, study design/method, and number of participants on table 1. In table 2 it is possible to see the intervention type used, professional group that used the intervention, duration time, and main results. To facilitate the presentation and results analysis, the studies were coded from E1 to E19. Of nineteen studies included in this review, seven are primary studies (S4, S5, S7, S10, S14, S17, S18) and twelve are literature reviews (S1, S2, S3, S6, S8, S9, S11, S12, S13, S15, S16, S19). The publication year of the studies included in this review range from 1997 to 2020. Most included studies were from the United States (S5, S8, S11, S13, S15, S16, S18) and the United Kingdom (S1, S2, S6, S9, S10, S19). The other articles are from the north of Europe: The Netherlands (3), Sweden (4), Norway (7). Finally, it included an article from Brunei (southeast of Asia, E12).

Table 1 - Characteristics of studies in the scoping review

Code	Author	Country	Study objective	Study design	Participants N
S1	Towler et al., 2013	United Kingdom	Assess the evidence of using acupuncture in the symptomatic control in a patient with cancer and with supportive care as well as to identify recommendations for clinical practice and future investigation.	Integrative review of reviews	403 patients with xerostomia

Code	Author	Country	Study objective	Study design	Participants N
S2	Davies & Hall, 2011	England	Review evidences of the clinical utility of used strategies on dysfunction management in salivary glands of patients with advanced cancer.	Integrative literature review	Patients with advanced cancer
S3	Nieuw Amerongen & Veerman, 2003	The Netherlands	Identify methods used to relieve the xerostomia symptoms involving stimulation of the residual salivary gland activity	Literature review	Patients with salivary gland hypofunction
S4	Meidell & Holritz Rasmussen, 2009	Sweden	To investigate if the acupuncture treatment is a viable option for a patient with xerostomia in an end-of-life situation.	Experimental study	117 patients with xerostomia: 67 within the inclusion criteria in the study, 14 were included, but only 8 finished the study
S5	Lopez et al., 2018	USA	To expand the ambulatory acupuncture effects on the symptoms reported by patients with advanced oncologic disease.	Retrospective analysis	375 patients with oncologic disease
S6	Davies et al., 2010	England	Analyse management strategies in the salivary gland dysfunction in patients with oncologic disease.	A systematic literature review	n/e
S7	Kvalheim et al., 2019	Norway	To study the efficiency of three different oral moisturizers in patients with palliative care needs: an aqueous solution of glycerol by 17%; the oxygenated glycerol triester and the Salient.	A randomized clinical trial	30 individuals per product
S8	Barford & D'Olimpio, 2008	USA	To incorporate current evidence and formulate efficient strategies to optimize results in common oncological symptoms as xerostomia.	Literature review	n/e
S9	Sheehy, L., 2013	United Kingdom	To present a general view of xerostomia and identify the objectives and assess oral hygiene and oral hygiene measures in end-of-life and palliative care.	Literature review	n/e
S10	Davies, A. N., 2000	United Kingdom (Sutton)	To compare the efficiency of artificial saliva from mucin (Saliva Orthana™) with chewing gum without sugar and low adhesion.	Randomized, prospective, opened and cross-reference study.	43 patients with advanced cancer
S11	Kahn & Johnstone, 2005	The United States (New York)	Description of therapies used in the preservation of the salivary glands function in patients submitted to radiotherapy to head and neck tumours.	Literature review	n/e
S12	Venkatasalu et al., 2020	Brunei	To summarize published evidence about the oral conditions of patients in palliative care and its impact, management and the challenges on the treatment of those conditions.	Systematic review	19 primary sources focused on palliative patients and their oral conditions.

Code	Author	Country	Study objective	Study design	Participants N
S13	Moore & Guggenheimer, 2008	USA	To describe the normal salivary function: the potential salivary dysfunction causes; oral problems related to hyposalivation and diagnosis tests as well as patient care options.	Literature review	n/e
S14	Sweeney et al., 1997	Scotland	To analyse the therapeutic effect of the Saliva Orthana spray compared with a placebo spray without mucin.	The clinical trial was a controlled single-phase double-blind project.	35 patients with dry mouth assisted in a day care unity or inpatient care.
S15	Reisfield et al., 2009	USA	Describe the factors and effects of xerostomia.	Descriptive study	n/e
S16	Dahlin C. et al., 2006	USA	To analyse the distressing symptoms of patients with advanced and progressive disease. An example of those symptoms are: nausea, vomiting, cold, diarrhea, constipation as well as dyspnoea, dysphagia, hiccups, xerostomia, dysgeusia and fatigue.	Review study	n/e
S17	Mercadante S. et al., 2000	Italy	To determine the role of pilocarpine in xerostomia reduction due to the used opioid	Open and prospective study. Inpatient or home care.	N=19 patients with advanced cancer, hepatic/renal/oropharyngeal disease
S18	Crogan, N.L., 2015	USA	To describe an improvement programme for xerostomia induced by medicine and to improve the food ingestion among senior people in nursing homes.	Experimental study using a pre-post design.	39 residents of elderly nursing homes that are cognitively intact from two different sites.
S19	Davies, A.N., 1997	UK	Identify strategies for the symptomatic management of xerostomia.	Literature review	n/e

On table 2 the summary about the data extracted from the analysed studies is continued. The main results and the details were stressed out as well as the main discoveries related to the revision matters.

**Table 2** - Characteristics of studies in the scoping review (continuation)

Code	Type of interventions	Professional group using the intervention	Intervention time	Outcome:
S1	Acupuncture	Not mentioned	Not mentioned	The acupuncture benefit was verified in patients with xerostomia related to radiation. Multicentric studies are necessary to ensure sample size
S2	Non-pharmacological: Saliva stimulants: chewing gum with sugar; organic ingredients such as ascorbic acid, citric acid, and malic acid; acupuncture; Saliva substitutes: water. Pharmacological: parasympathomimetic (pilocarpine, bethanechol chloride, distigmine ;piridostigmina); artificial saliva.	Physicians and nurses	Not mentioned	The xerostomia management should be individualized and the priority should be the cause of treatment. Saliva stimulants are recommended in favour of their substitutes. Using chewing gum without sugar should be prioritized



Code	Type of interventions	Professional group using the intervention	Intervention time	Outcome:
S3	Non-pharmacological: Use of gustatory stimuli, with chewing gum; vitamin C tablets. Commercial or homemade elixirs (saline solution, bicarbonate and lemon). Saliva substitute, Diet (acidic fruits, cold cucumber or tomato slices or cold apple slices; cold drinks) Acupuncture as an additional therapy. Pharmacological: use parasympathomimetic (pilocarpine or cevimeline).	Dentists	Not mentioned	Radiotherapy treatment and head and neck oncological disease are the most common causes of salivary gland hypofunction. The saliva flow can be activated through mechanical or pharmacological stimulation of the salivary glands. The sore and damaged oral mucosa can be treated, softened and lubricated with mouthwash and gel ointment Oral palliative care for patients with xerostomia when saliva discharge is impossible or very low and supportive therapy when the salivary gland can be stimulated.
S4	10 acupuncture treatments were realized. The effect was measured by the analogical visual scale and by measurement of saliva production before and after the treatment (Navazesh and Christensen method, 1982).	Nurse with experience in acupuncture	10 acupuncture treatments for 5 weeks (2x/week). For 2 years (2004-2006)	Patients experienced dry mouth relief, mainly after the 4 <sup>th</sup> or 5 <sup>th</sup> treatment. The authors recommend studies with larger samples.
S5	Acupuncture	Acupuncturist	Average number of treatments were 4 and 6 for a total of 1728 treatments from January to December of 2016.	Response clinical rates were higher than 50% to nausea, lack of air, well-being, spiritual pain, heat wave, numbness and, xerostomia. In the first follow-up a statistically significant improvement was observed in the researched symptoms.
S6	Non-Pharmacological: use of saliva stimulants and saliva substitutes: chewing gum without sugar, organic acids (ascorbic acid, citric acid). Acupuncture, electrostimulation. Daily hygiene. Pharmacological: parasympathomimetic (eg pilocarpine hydrochloride, bethanechol chloride, anetholetrithione and yohimbine).	Oncological health professionals in palliative care and odontology.		To prevent the salivary gland dysfunction induced by radiation. The salivary gland dysfunction treatment should be individualized. To consider treatment of the cause or causes of salivary gland dysfunction and the proper saliva stimulant. More knowledge about the salivary gland dysfunction related to cancer. Sugar drinks and foods should be avoided as well as acid medicine. Oral hygiene products with alcohol should be avoided. Regular dental revision should be done.
S7	Aequasyl was sprayed on the mucosa; the glycerol was applied with a soaked gauze and the Salient was dispensed to the patient by a spoon.	Dentists	The total time of the intervention was 3 days. The study was carried out from 1 March 2018 to 30 November 2018.	None of the three tested products were considered adequate. The 17% glycerol concentration had the most positive effect immediately after the application but less or no effect 2 hours after. Aequasyl and Salient had a long-lasting effect, but they were not preferred by patients. There is the need and necessity for better products and more research. The glycerol solution was preferred by that group of patients and the short time effect could be balanced with frequent applications.
S8	Recently, a supersaturated solution of calcium and phosphorus was approved for the usage in mucositis and xerostomia in patients undergoing chemoradiation.	Dentists		Xerostomia may be the result of polypharmacy. Cancer patients should undergo dental treatment before undergoing chemotherapy treatment. Using antihistamines, antidepressants and diuretics should be considered before starting chemotherapy.
S9	Non-pharmacological; Introduction of educational programmes on the importance of oral hygiene. Use as indicated: foam sticks for comfort measures; hydrogen peroxide; sodium bicarbonate; chlorhexidine, chewing gum; malic acid, vitamin C, and spray gel; topical use of petroleum-based products. Acupuncture; and family involvement. Review prescribed medication.	Nurses	n/e	Xerostomia is the third most frequent symptom in palliative care, when excluding pain (Al-Shahri et al., 2012). Patients have related this symptom as distressing. The guarantee of oral care in end-of-life patients can have a major physical, social and psychological well-being impact. Adequate training of nurses, enhances good practices and improves xerostomia management.



Code	Type of interventions	Professional group using the intervention	Intervention time	Outcome:
	Oral assessment of the client on admission and at regular intervals.			
S10	Using artificial saliva via spray before breakfast, before lunch, before dinner and before sleep time. Chewing the gum before breakfast, before lunch, before dinner and before sleep time.	n/e	Each patient received 5 days of treatment for each product with a 2-day break in changing between products.	Both artificial saliva and gum are efficient in xerostomia management. 68% of patients preferred chewing gum over the artificial saliva.
S11	Non-pharmacological: acupuncture; tap water with saline solution; bicarbonate solutions; mouthwashes; saliva substitutes; sugar-free tablets or gum. Pharmacological: amifostine; pilocarpine hydrochloride; Cevimeline (Evoxac), intravenous. Surgery to transfer the submandibular gland to the submental space.		Before, during and after radiotherapy	Amifostine leads to reduction of acute and chronic xerostomia after radiotherapy. Little consistent results regarding the use of pilocarpine. Xerostomia was avoided in 83% of patients in the surgical group. Acupuncture in study.
S12	Non-pharmacological: acupuncture; lubrication of the lips, mucosa with salivary substitutes and oral hygiene. Medical treatments. Dentists collaboration in the palliative care team.	Nurses and Dentists	Standard oral hygiene	Oral hygiene: it has improved dry mouth in patients by 80% or more. Challenges: Lack of knowledge by the health professionals and lack of collaboration by the patient.
S13	Non-pharmacological: avoid alcohol beverages, avoid mouthwash containing alcohol; use humidifiers; use salivary flow stimulants. Pharmacological: use of alternative medicine.	Dental medicine		Management of xerostomia through using alternative medicines; avoid alcoholic beverages, avoid mouthwashes containing alcohol; use humidifiers at night; use salivary flow stimulants. Saliva substitutes/lubricants are most useful when used just before bedtime or talking. Complications of xerostomia: dental caries and candidiasis. Diagnostic tests with yes and no questions were used for evaluation.
S14	Supplied Saliva Orthana oral spray, containing sodium fluoride and mucin as well as the placebo containing the same constituents but without mucin. Xerostomia with analogue scales to assess saliva production.	Dentists	They were accessed after 7 and 14 days,	There were no substantial differences between the two groups of patients regarding visual analogue scales of symptoms and the clinical picture. The classification of xerostomia, without any statistical scope. Both the active and placebo sprays alleviated oral dryness for many of the participants. Overall, the results indicate an important beneficial effect of oral sprays in controlling xerostomia in cancer patients.
S15	Non-pharmacological: review the therapy; stimulate residual gland function; saliva substitutes; stimulate oral hydration and optimize oral hygiene.			Aetiology, due to medication use and anticholinergic activity, head and neck radiotherapy, psychiatric comorbidities such as mood and anxiety disorders, and dehydration. Treatment: eliminate unnecessary drugs and/or titrate the possibility of modifying the dosage; stimulate residual gland function; saliva substitutes; stimulate oral hydration, and optimize oral hygiene.
S16	Non-pharmacological: Dietary changes that include avoiding sugars, spicy foods, sometimes salt, and dry or spicy foods. Moisten the food with fluids. Pharmacological interventions include pilocarpine, 5 mg orally three times daily; bethanechol, 25 mg three times daily and management of symptoms other than pain. Daily; methacholine, 10 mg daily; or cevimeline spray or mouthwash.			Xerostomia is experienced usually by patients in palliative care. It results from reduced salivary secretion, mouth erosion, local or systemic dehydration, and various mental illnesses. Assessment reveals thick, sticky, or absent saliva.

Code	Type of interventions	Professional group using the intervention	Intervention time	Outcome:
S17	Pharmacological interventions: All patients were treated with pilocarpine (eye drops, 2% solution) 5 mg orally.	Health professionals	Three times a day during one week.	Xerostomia can cause difficulty speaking, swallowing, and dysgeusia. It may be a symptom of systemic disease, an adverse effect of treatment with anticholinergic, antiadrenergic or cytotoxic drugs, or due to local radiotherapy. Opioid use is strongly associated with xerostomia. However, in this case there was no significant correlation between opioid dose and xerostomia. Xerostomia occurred in patients who discontinued pilocarpine. Polycarpine was well tolerated.
S18	Participants were given a small amount of lemon ice cream without sugar before meals for 6 weeks. For comparison, before the intervention, participants during the initial 6 weeks, drank 2 glasses of non-citrus beverage before meals.	Nurses	Six weeks	Statistically significant improvements were found in the food intake of the intervention target inpatients without any modification to existing medication regimens. By stimulating salivation with an acidic citrus fruit ice cream, the need for fluids was reduced, while the caloric intake was increased.
S19	Non-pharmacological: saliva substitutes; artificial saliva, glycerin combined with lemon. Saliva stimulants, organic acid and chewing gum, pilocarpine, ascorbic acid, citric acid, mouthwash. Malic acid and acupuncture. Pharmacological: nicotinamide, pilocarpine, bethanechol choline esters, anticholinesterases, distigmine and pyridostigmine.	Doctors		Saliva stimulants are preferred over saliva substitutes. Chewing gum is effective and well tolerated and can be a good first-line treatment. Acupuncture has been recognized as a treatment for xerostomia in Chinese medicine. Recently adopted by western medicine. Dietary advice can be helpful for a person to control xerostomia.

### I -The interventions used to control xerostomia in palliative patients

The interventions used for xerostomia control in palliative patients, the studies point out for the following non-pharmacological interventions: acupuncture (E1, E2, E3, E4, E5, E6, E9, E11, E12, E19), saliva substitutes as artificial saliva and glycerine (E2, E10, E11, E12, E15, E19), saliva stimulants as: chewing gum, ascorbic acid, citric acid and malic acid (E2, E3, E6, E7, E9, E10, E11, E13, E14, E15, E18, E19). Still under the non-pharmacological intervention scope are: the food regimen changes, avoiding alcohol beverages and sugar rich foods (E3, E6, E13, E16, E19), the importance of oral hygiene educational programmes (E6, E9, E12, E15) and electrostimulation (E6). The pharmacological interventions were also highlighted as an important treatment in xerostomia control like the parasympathomimetic medicine: pilocarpine (E2, E3, E6, E11, E16, E17, E19) and bethanechol chloride (E2, E6, E16, E19).

### ii- Characteristics (intervention and duration type) of those interventions

In what concerns the intervention characteristics, the studies point out to the non-pharmacological interventions frequency that depends on the type of treatment used. Acupuncture was used for 5 weeks, two times per week (E4) in a total of 4 or 6 treatments (E5). The saliva stimulants were used for three to five days (E7, E10) and citric acid before meals were used for six weeks (E18). Saliva substitutes were used between 7 to 14 days (E14). Pharmacological interventions were based on the use of pilocarpine three times a day for a week (E17).

### iii- Specific health professional area that performs those interventions

The xerostomia control interventions were used mainly by: dentists (E3, E7, E8, E12, E13, E14), nurses (E2, E9, E12, E18), nurses with acupuncture training (E4), doctors (E2, E19), acupuncturists (E5) and health professionals in oncology, palliative care and odontology (E6, E17). Diagnosis tests with yes or no questions were used to assess some of the interventions as the salivary function and the saliva substitutes effect. (E13). Clinical assessment of the client's oral cavity, upon admission to the health service and its reassessment at regular intervals, was the strategy used to understand the effectiveness of educational programmes on the relevance of oral hygiene. (E9). The use of acupuncture to control xerostomia was evaluated in one of the studies used in this review, through a visual analogue scale, and by measuring saliva production before and after treatment (E4).

## 3. DISCUSSION

The studies under review revealed that xerostomia is a common symptom in palliative and end-of-life patients. This symptom is usually associated with significant morbidity and a decrease in the quality of life of these patients. (Meidell & Hoirtz Rasmussen, 2009; Lopez et al., 2018; Sheehy, 2013, Reisfield et al., 2009). Fleming and collaborators (2020) While assessing the xerostomia impact in daily activities (from 135 patients with advanced and progressive disease) concluded that xerostomia had a major negative impact in speaking capability, eating and food tasting. This situation also interfered with nasal mucosa dryness, swallowing and sleep. Saliva produced by the parotid, submandibular and sublingual glands is estimated to be about 0.5 L/day to 1 L/day and flow rates can fluctuate up to 50% with diurnal rhythms in adults. Salivary dysfunction (translated by the decrease in these flows) can be induced by drug therapy; disease states, radiotherapy treatment; anxiety, depression or stress (Moore & Guggenheimer, 2008). Xerostomia is reported by end-of-life patients to be an uncomfortable and very distressing symptom. (Sheehy, 2013). As a consequence, pain in the oral cavity, accelerated dental morbidity, infections of the oral mucosa, fissures and ulcers, halitosis, alteration in the taste and appreciation of food, chewing and swallowing difficulties, nutritional impairment, difficulty in speaking perceptibly and related problems with the dental prosthesis can arise (Reisfield et al., 2009, Fleming et al., 2020). According to this review, it has become consensual that the etiology of xerostomia is multifactorial, and may be associated with the adverse effect of treatment with anticholinergic, antiadrenergic or cytotoxic drugs, which cannot be discontinued due to the refractory symptoms that people in palliative situations have. (Barford & D'Olimpio, 2008; Moore & Guggenheimer, 2008; Reisfield et al., 2009; Sheehy, 2013; Crogan, 2015). Xerostomia is associated to radiotherapy treatments (Nieuw Amerongen & Veerman, 2003; Kahn & Johnstone, 2005; Moore & Guggenheimer 2008; Reisfield et al., 2009; Mercadante et al., 2000), anxiety, depression and stress states (Moore & Guggenheimer 2008; Reisfield et al., 2009). The analysed studies allowed mapping interventions for the control of xerostomia in palliative care. The systematic evaluation of the oral cavity is presented as an intervention of great relevance (Sheehy, 2013; Lopez et al., 2018). The remaining interventions were grouped into three areas: preventive care, symptom relief and training of family caregivers. (Sheehy, 2013). In what concerns preventive care, it includes hydration, oral hygiene with a small brush for 2 minutes, odontology consultation and ambient humidification (Venkatasalu et al., 2020, Sheehy, 2013). Symptom relief involves the use of non-pharmacological measures as well as pharmacological measures, resorting to the treatment of the underlying cause and the use of polycarpine. (Mercadante et al., 2000). Under non pharmacological measures it is included saliva production stimulation resorting to the use of saliva stimulants instead of substitutes as well as diet adequacy (Davies et al., 2011; Crogan, 2015) and acupuncture (Meidell & Holritz Rasmussen, 2009; Lopez et al., 2018). The seven primary analysed studies allowed us to know that the evidence relating to the type of treatment for xerostomia needs a larger number of clinical trials with amplified samples. Acupuncture revealed to be efficient in the relief of oral cavity dryness (Meidell & Holritz Rasmussen, 2009; Lopez et al., 2018). The idea of the need to obtain more studies, with larger samples, about the use of acupuncture in the relief of xerostomia, in people in palliative and end-of-life situations, is unanimous. (Lopez et al., 2018). Randomized clinical trials support the use of pilocarpine and saliva stimulants, such as chewing gum and citric acid-rich stimulants, in the treatment of xerostomia (Davies, 2000; Mercadante et al., 2000; Crogan, 2015; Kvalheim et al., 2019).

This revision allowed us to understand the importance of educating xerostomia patients and families about measures to take to prevent complications and get relief from symptoms (Sheehy, 2013). This revision is an opportunity to point out the oral care. Even though they are basic and essential care most of the time health professionals, by many reasons, end up omitting them, because they are considered as a non-priority care in relation to other care (Lourenço, 2017). Since this theme has interference with quality of life, especially for those with xerostomia, this scoping revision is of great value since it connects the aspects related to the need for systematic assessment of the oral cavity, preventive care, symptom relief and treatment of xerostomia. It guides as well quality clinical practices necessary for those in a palliative and end-of-life situation that suffers with or have tendency to develop this problem.

## CONCLUSION

Xerostomia is a health condition that can cause halitosis, sleep disorders, speech deficits, chewing and swallowing disorders, which result in malnutrition. Consequently, it generates social embarrassment and chronic discomfort, causing suffering and a great impact on people's quality of life. Due to the prevalence of patients in palliative and end-of-life situations and the scarcity of an existing evidence base, more research is required to improve the quality of life, a reality for people who suffer from xerostomia. It is critical for health professionals to prioritize oral cavity assessment and preventive care interventions, focusing on hygiene care and oral hydration, and environmental humidification, without forgetting people with compromised conscience. The prevention and relief of symptoms, in people with the potential risk of developing xerostomia, associated with taking medication, treatments such as radiotherapy, and states of anxiety, depression, and stress, is also a priority. Grouping and synthesizing the available evidence, within this theme, can help health professionals to incorporate them into clinical practice, thus contributing to an increase in excellence in the provision of care. The limitations and weaknesses perceived, throughout and during this research,

are related to the reduced scientific dissemination, updated on this topic, and the scarcity of studies focused on the systematic evaluation of the interventions implemented for the control of xerostomia.

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