

Xerostomia in the older adult population, from diagnosis to treatment: a literature review

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ABSTRACT | Saliva is important for the preservation and maintenance of normal physiological conditions of oral tissues, and factors influencing its decrease are associated with the risk for oral diseases. Xerostomia is the subjective sensation of oral dryness, which can be influenced by etiological factors including the use of several types of medications, Sjogren's and metabolic syndromes, head and neck irradiation, among others. Treatment methods for xerostomia vary and can be local or systemic. The aim of this article is to present the results of a literature review addressing the correlation between xerostomia and its incidence and prevalence in the older adult population. Results of this review highlight the importance of diagnosis and appropriate management, and briefly describe treatment modalities and etiological factors such as medications, Sjogren's syndrome, metabolic syndrome, and head and neck irradiation.

DESCRIPTORS | Xerostomia; Dry mouth; Saliva.

RESUMO | **Xerostomia na população idosa, do diagnóstico ao tratamento: revisão da literatura** • A saliva é importante para a preservação e manutenção das condições fisiológicas normais dos tecidos bucais, e os fatores que influenciam sua diminuição estão associados ao risco de doenças bucais. Xerostomia é a sensação subjetiva de secura oral, que pode ser influenciada por fatores etiológicos, incluindo o uso de vários tipos de medicamentos, síndromes metabólicas e de Sjögren, irradiação de cabeça e pescoço, entre outros. Os métodos de tratamento para xerostomia variam e podem ser locais ou sistêmicos. O objetivo deste artigo é apresentar os resultados de uma revisão bibliográfica abordando a correlação entre xerostomia e sua incidência e prevalência na população idosa. Os resultados desta revisão destacam a importância do diagnóstico e do manejo adequado e descrevem brevemente as modalidades de tratamento e fatores etiológicos, como medicamentos, síndrome de Sjögren, síndrome metabólica e irradiação de cabeça e pescoço.

DESCRITORES | Xerostomia; Boca seca; Saliva.

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INTRODUCTION

Xerostomia is characterized as the subjective sensation of dry mouth, whereas hyposalivation describes a reduction in salivary flow. Xerostomia, however, does not necessarily imply a decrease in salivary flow because patients who do not exhibit hyposalivation may exhibit xerostomia.¹

Salivary function remains remarkably intact in healthy older adults; however, numerous etiological factors can induce and/or maintain xerostomia, including dehydration, mouth breathing, hormonal changes, autoimmune diseases – e.g., Sjogren's syndrome –, chronic mouth breathing caused by disease, head and neck irradiation, diseases such as diabetes mellitus, nephritis, thyroid dysfunction, HIV infection, kidney diseases, and continuous use of numerous medications. The latter seems to be the most common cause of xerostomia in older adults because most are treated with at least one medication that causes salivary hypofunction.²

Xerostomia is not directly associated with the normal aging process in older adults but as a consequence of disease, or as a side effect of medication(s).^{1,3} Approximately 30% of the population ≥ 65 years of age experience some type of dry mouth-related disorder.¹

The objective of this study was to perform a review of the literature addressing xerostomia to demonstrate the importance of diagnosis and appropriate management, and to describe applicable treatment modalities.

MATERIALS AND METHODS

A bibliographic search of the scientific literature indexed in the PubMed and Google Scholar databases was performed using the keywords “Xerostomia”, “Dry mouth”, “Saliva”, and “Elderly”. Articles published in Portuguese and/or English, available in full-text, and published in the past 15 years were included. After screening, 26 articles were selected.

Literature review

Xerostomia and hyposalivation

The term “xerostomia” is related to several concepts and often correlated with decreased salivary flow or simply the subjective sensation of dry mouth, thus causing confusion regarding the term.⁴ Xerostomia may result from decreased or altered salivary gland function, with changes in salivary quality/quantity.⁴ Hyposalivation, with or without the sensation of dry mouth, can result from several causes, although its main etiological factors are the inhibition of salivation reflex and alterations in the salivary glands.⁵

Prevalence of xerostomia

Studies addressing the prevalence of xerostomia in diverse populations have reported significant variability, possibly due to the different definitions and instruments used to measure it. As such, prevalence varies from 10% to 46%, with a lower prevalence in men (9.7-25.8%) than in women (10.3-33.3%).⁶ A recent systematic review suggests a prevalence of approximately 20%, although this figure appears to be higher in older and institutionalized populations.⁷

It is generally accepted that aging alone has no significant clinical impact on salivary flow; however, the prevalence of xerostomia appears to increase with age, affecting mainly middle-aged and older individuals,⁸ which can be explained by the greater number of drugs used by these populations.

Etiological factors of xerostomia

Medication

Although aging does not correlate with a higher prevalence of xerostomia, its occurrence may be the result of certain types of drugs used by older populations or the combination of many drugs (i.e., polypharmacy).⁷ Several studies^{3,6,9} have reported

that groups of drugs, such as antidepressants, anticholinergics, antihistamines, and anxiolytics and antihypertensives, may largely explain the prevalence of xerostomia.

Sjogren's syndrome

Sjogren's syndrome is a systemic autoimmune disease that generates chronic inflammation of the exocrine glands and usually affects the salivary and lacrimal glands,⁹ leading to dryness of the major mucosal surfaces including the mouth, eyes, nose, pharynx, larynx, and vagina.⁸

The etiology of Sjogren's syndrome appears to have a genetic and environmental basis. The disease affects mostly middle-aged women but can also affect children, men, and older adults. When symptoms of dryness appear in a previously healthy individual, the syndrome is classified as primary Sjogren's syndrome. Sjogren's syndrome associated with other underlying systemic autoimmune diseases – e.g., systemic lupus erythematosus, rheumatoid arthritis or scleroderma – is known as secondary Sjogren's syndrome.¹⁰

Metabolic syndrome

Metabolic syndrome has received worldwide attention in recent years due to its increasing prevalence (20% to 30%) in the adult population of virtually all Western countries, and has grown in parallel with obesity.¹¹ This syndrome is characterized as a group of related diseases, including hyperglycemia, obesity, hypertension, dyslipidemia, diabetes mellitus and cardiovascular disease, all of which are related to insulin resistance.¹

Salivary pH and flow rate are affected by several components of the metabolic syndrome.¹

Head and neck irradiation

Salivary tissue is highly vulnerable to radiation damage, and the parotid glands are the most easily damaged. Radiation doses as low as 20 Gray (Gy)

may cause permanent discontinuation of salivary flow if applied in a single dose. Salivary dysfunction is severe at > 52 Gy doses. Oral cancer treatment usually involves the administration of 60 Gy and 70 Gy doses, which may lead to a rapid decrease in flow during the first week of radiation, with a possible 95% reduction in the region. After 5 weeks of radiation, salivary flow virtually ceases and rarely recovers completely, and stimulated and resting salivary flow is inhibited. The degree of xerostomia depends on the degree of salivary tissue exposed to radiation, with partially irradiated glands exhibiting greater salivary flow than fully irradiated glands.⁸

Radioiodine treatment has been used to treat thyroid cancer for > 70 years. One of its main complications is xerostomia, which is caused by radiation damage to the salivary glands. Xerostomia rates in these patients are high, ranging from 42.9% to 54%.¹²

Xerostomia in these patients can lead to an increased susceptibility to dental caries, a higher tendency to develop opportunistic fungal infections (*Candida albicans*), and loss of denture retention.¹³

Other conditions

Dehydration due to reduced fluid intake, vomiting, and diarrhea may result in xerostomia. Dry mouth is also a common complaint in patients with diabetes mellitus. Psychogenic causes – e.g., fear, stress, depression and anxiety – can also result in xerostomia. In cases of Alzheimer's disease or stroke, patients may complain of dry mouth in the presence of normal salivary secretion due to altered perception.¹⁴

Treatment

The first step in treating patients with xerostomia is to establish a correct diagnosis. This often involves a multidisciplinary team of health professionals, among whom communication is essential because many older individuals have concomitant medical problems and polypharmacy complications. The

second step is to schedule frequent dental evaluations of patients at risk of oral complications due to low salivary flow.⁶

The surfaces of dried mucous membranes and dysphagia are treated with oral moisturizers and lubricants, artificial saliva, and the nocturnal use of bedside humidifiers. Clinicians should instruct patients to drink liquids while eating, especially if the food is dry and/or rough in texture.^{2,4,15,16}

Local treatment

Numerous saliva substitutes and topical agents – e.g., sugar-free gums and lozenges – are currently available and have been shown to provide relief of xerostomia by improving lubrication and hydration of oral tissues. The first goal is to physiologically increase salivary secretion to improve patient quality of life and, if not, then by artificial means.¹⁰

Symptomatic relief such as drinking water throughout the day or holding pieces of ice in the mouth to provide moisture can be sufficient to relieve symptoms. Other measures include sucking on pineapple slices, frequent sips of orange juice or semi-frozen fruit juice, or the use of sugar-free chewing gum. Patients may use olive oil and some dry-mouth products containing olive oil, with effective benefits for xerostomia.¹⁷

Salivary stimulation tablets provide subjective relief of dry mouth, improving the quality of life in patients with radiation-induced xerostomia.¹⁵ Saliva substitutes consist mainly of aqueous solutions containing the same mineral salts as those found in human saliva, thus mimicking the natural functions of these elements within the oral cavity. Artificial saliva usually contains enzymes with antimicrobial action or mucins as lubricants. These formulations sometimes contain elements that add extra protection to avoid excess bacterial colonization of oral tissues and, in turn, the development of dental caries.¹⁸

However, the viscosity, surface tension, and adsorption/desorption of salivary substitutes significantly differ from saliva and may limit the duration and/or extent of their effects.¹⁹

Cholinergic agonists

Muscarinic receptor agonists M3 (pilocarpine and cevimeline) administered orally are used to increase salivary secretion. Systemic pilocarpine has been discovered as an effective means of treating xerostomia secondary to head and neck radiation. More recently, this medication was found to have a potential benefit in patients with Sjogren's syndrome, especially in those with symptomatic extraoral exocrinopathy.¹⁵

Clinical experience to date suggests that pilocarpine is safe and well tolerated, with no serious adverse effects or tachyphylaxis.⁸

Electrostimulation

Neural electrostimulation of salivary gland function by application of electrical current through the oral mucosa in receptors in the afferent nerve pathways has been reported to increase saliva production and reduce the symptoms of xerostomia induced by various conditions.⁸

More recently, the use of extra-oral transcutaneous electrical nerve stimulation (TENS) on the parotid gland has been reported to effectively increase salivary production in healthy individuals, suggesting that TENS can directly stimulate the auriculotemporal nerve, which innervates the secretory unit of the parotid gland.^{8,20}

Acupuncture

Acupuncture is a traditional Chinese medicine technique used to treat various pathologies in a palliative or curative manner and is recognized by the World Health Organization.¹

The mechanisms of increasing the salivary flow rate in patients with xerostomia involves several

related factors, including increased local blood flow, the release of neuropeptides, and reflex mechanisms that promote parasympathetic stimulation. Results from studies involving patients with xerostomia have suggested that acupuncture may induce a prolonged increase in salivary flow rates. Several studies have confirmed the beneficial effects of acupuncture in the treatment of xerostomia caused by several diseases such as Sjogren's syndrome, head and neck radiotherapy, hypothyroidism, or idiopathic causes.²¹⁻²³

Laser

Studies have shown that cancer patients undergoing laser phototherapy (1.5 J/cm², 60 MW) to treat oral mucositis reported an improvement in saliva production and swallowing capacity. Stimulation of the salivary glands and improvement of xerostomia symptoms in a patient with Sjogren's syndrome was also observed.^{24,25}

DISCUSSION

Xerostomia is a symptom that mainly affects the older adult population.^{1-4,26,27} Women are more affected than men,²⁰ with approximately one-third of those ≥ 65 years of age experiencing symptoms of xerostomia.¹ The xerostomia diagnosis has become increasingly frequent due to the growth of the older adult population both in Brazil and worldwide, given general increases in life expectancy.¹⁵

Saliva is essential in maintaining the health of the entire stomatognathic complex, having lubricating properties that facilitate the formation of the food bolus, in chewing, swallowing, and phonetics and phonation. Aside from the maintenance of oral pH (with its buffering action, which is active in the remineralization/demineralization process), saliva also plays a role in physical/chemical phenomena that act in the retention and stability of prostheses, has also having bactericidal, antiviral, and antifungal activity.⁶

According to Turner et al.,² the most common cause of xerostomia is the use of various prescription and/or non-prescription medications. Several authors have cited drugs associated with the prevalence of xerostomia such as antidepressants, anticholinergics, antihistamines, anxiolytics, and antihypertensives.^{2,3,6,9}

Sjogren's syndrome is characterized as an autoimmune disease in which patients experience dysfunction of the secretory glands, with several systemic alterations, including dryness of the mucous membranes (oral, nasal, vaginal) or dry eyes (due to decreased flow lacrimal). Metabolic syndrome is also important and related to multiple systemic diseases, e.g., vascular diseases, diabetes mellitus, and dyslipidemia. The decrease in salivary flow rate in individuals with metabolic syndrome is related to the destruction of the acinar cells of the salivary glands.^{8,9}

Head and neck irradiation is another factor that leads to the symptomatology of xerostomia via the destruction of the salivary glands exposed to radiation therapy.^{24,25}

Strategies for the treatment of xerostomia symptomatology include palliative measures that can be local or systemic. The primary objective is to physiologically stimulate the patient's salivary flow and, secondarily, by artificial means.⁸ Various treatment modalities have been described in the literature, ranging from mouthwashes with filtered water to low-power laser therapy and acupuncture.^{18,24,25}

There are numerous options for local treatment methods, including the use of artificial saliva with mouthwash; sugarless gums that stimulate salivary flow by masticatory activity; salivary stimulation tablets; and moisturizers and oral lubricants.¹⁵ Dietary guidance (low sucrose), with strict control of oral hygiene is crucial to prevent and treat the eventual oral consequences of xerostomia.¹⁸

For systemic treatment, options include agonist drugs of the muscarinic receptor M₃, pilocarpine and

cevimeline. They act similarly to acetylcholine at M₃ receptors, stimulating the parasympathetic branch of the autonomic nervous system and increasing secretion from the exocrine glands, which in turn stimulate salivary flow.⁴

Xerostomia is a symptom with significant impact on oral health that can lead to the worsening of oral prosthesis retention, to increases in the incidence of caries, oral candidiasis, and in the incidence and severity of periodontal diseases, oral tissue dehydration, dryness of the lips; moreover, increase in the presence and extension of saburral tongue, halitosis, mucositis, and oral burning sensation may occur. Lingual fissures, dysgeusia, dysphagia, problems in phonation, chewing, and swallowing can also occur due to xerostomia.^{1-4,6,9,10,15,16,18,28}

FINAL CONSIDERATIONS

1) Xerostomia is a symptom that mainly affects the older adult population, with significant negative impact on oral health. The use of medication(s) is its primary etiological factor.

2) Multidisciplinary treatment is essential to diagnose and treat the inherent complications of xerostomia and provide a better quality of life to patients. There are local and systemic treatments, and many studies reported improvements in symptomatology.

3) Dental follow-up is necessary, both for symptomatology and its consequences. Therefore, the role of the dental surgeon is crucial in the diagnosis and treatment of this symptom.

REFERENCES

1. Abrantes JPM. A xerostomia no idoso [dissertação]. Porto: Universidade do Porto, 2014.
2. Turner MD, Ship JA. Dry mouth and its effects on the oral health of elderly people. *J Am Dent Assoc.* 2007;138 Suppl:15S-20S. doi: 10.14219/jada.archive.2007.0358.
3. Montenegro FLB, Pereira CMM, Marchini L, Nascimento DFF. Efeitos colaterais bucais dos medicamentos em idosos: um ponto muito importante para discussão pela equipe interdisciplinar de cuidados em saúde. Meeting de Função Oral do Idoso; 2004 Sep 2-4; Helsinki. Athens: ECG; 2004.
4. Feio M, Sapeta P. Xerostomia em cuidados paliativos. *Acta Med. Port.* [Internet]. 2005 [cited 2019 Oct 17];18(6):459-66. Available from: <http://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/1064>
5. Proctor GB, Carpenter GH. Salivary secretion: mechanism and neural regulation. *Monogr Oral Sci.* 2014;24:14-29. doi: 10.1159/000358781.
6. Hopcraft MS, Tan C. Xerostomia: an update for clinicians. *Aust Dent J.* 2010;55(3):238-44. doi: 10.1111/j.1834-7819.2010.01229.x.
7. Orellana MF, Lagravère MO, Boychuk DG, Major PW, Flores-Mir C. Prevalence of xerostomia in population-based samples: a systematic review. *J Public Health Dent.* 2006;66(2):152-8. doi: 10.1111/j.1752-7325.2006.tb02572.x.
8. Porter SR, Scully C, Hegarty AM. An update of the etiology and management of xerostomia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2004;97(1):28-46. doi: 10.1016/j.tripleo.2003.07.010.
9. Rosa LB, Zuccolotto MCC, Bataglion C, Coronatto EAS. Odontogeriatrics – a saúde bucal na terceira idade. *RFO UPF.* 2008;13(2):82-6. doi: 10.5335/rfo.v13i2.599.
10. Koshy JM, John M, George P. Primary Sjögren syndrome. *Natl Med J India.* 2014;27(2):120.
11. Tremblay M, Brisson D, Gaudet D. Association between salivary pH and metabolic syndrome in women: a cross-sectional study. *BMC Oral Health.* 2012;12(1):40. doi: 10.1186/1472-6831-12-40.
12. Alexander C, Bader JB, Schaefer A, Finke C, Kirsch CM. Intermediate and long-term side effects of high-dose radioiodine therapy for thyroid carcinoma radioiodine treatment. *J Nucl Med.* 1998;39(9):1551-4.
13. Guggenheimer J, Moore PA. Xerostomia: etiology, recognition and treatment. *J Am Dent Assoc.* 2003;134(1):61-9. doi: 10.14219/jada.archive.2003.0018.
14. Pijpe J, Kalk WW, Bootsma H, Spijkervet FK, Kallenberg CG, Vissink A. Progression of salivary gland dysfunction in patients with Sjögren's syndrome. *Ann Rheum Dis.* 2007;66(1):107-12. doi: 10.1136/ard.2006.052647.
15. Brosky ME. The role of saliva in oral health: strategies for prevention and management of xerostomia. *J Support Oncol.* 2007;5(5):215-25.

16. Córte-Real IS, Figueiral MH, Campos JCR. As doenças orais no idoso – considerações gerais. *Rev. Port. Estomatol. Cir. Maxilofac.* 2011;52(3):175-80. doi: 10.1016/j.rpemd.2011.05.002.
17. Rhodus NL, Bereuter J. Clinical evaluation of a commercially available oral moisturizer in relieving signs and symptoms of xerostomia in postirradiation head and neck cancer patients and patients with Sjogren's syndrome. *J Otolaryngol.* 2000;29(1):28-34.
18. Silvestre FJ, Minguez MP, Suñe-Negre JM. Clinical evaluation of a new artificial saliva in spray form for patients with dry mouth. *Med Oral Patol Oral Cir Bucal.* 2009;14(1):E8-E11.
19. Christersson CE, Lindh L, Arnebrant T. Film-forming properties and viscosities of saliva substitutes and human whole saliva. *Eur J Oral Sci.* 2000;108(5):418-25.
20. Strietzel FP, Martín-Granizo R, Fedele S, Lo Russo L, Mignogna M, Reichart PA, et al. Electrostimulating device in the management of xerostomia. *Oral Dis.* 2007;13(2):206-13. doi: 10.1111/j.1601-0825.2006.01268.x.
21. Braga FPF. Avaliação da acupuntura como método de tratamento preventivo e curativo de xerostomia decorrente da radioterapia [dissertação]. São Paulo: Universidade de São Paulo; 2006. doi: 10.11606/D.23.2006.tde-05052006-164329.
22. Blom M, Dawidson I, Angmar-Månsson B. The effect of acupuncture on salivary flow rates in patients with xerostomia. *Oral Surgery Oral Med Oral Pathol.* 1992;73(3):293-8. doi: 10.1016/0030-4220(92)90124-9.
23. Blom M, Lundeberg T. Long-term follow-up of patients treated with acupuncture for xerostomia and the influence of additional treatment. *Oral Dis.* 2000;6(1):15-24.
24. Simões A, de Campos L, de Souza DN, de Matos JA, Freitas PM, Nicolau J. Laser phototherapy as topical prophylaxis against radiation-induced xerostomia. *Photomed Laser Surg.* 2010;28(3):357-63. doi: 10.1089/pho.2009.2486.
25. Lopes CO, Mas JRI, Zângaro RA. Prevenção da xerostomia e da mucosite oral induzidas por radioterapia com uso do laser de baixa potência. *Radiol. Bras.* 2006;39(2):131-6. doi: 10.1590/S0100-39842006000200012.
26. Delli K, Livas C, Spijkervet FK, Vissink A. Internet information on xerostomia: what should patients expect? *Oral Dis.* 2015;21(1):83-9. doi: 10.1111/odi.12213.
27. Lopes FF, Silva LFG, Carvalho FL, Oliveira AEF. Estudo sobre xerostomia, fluxo salivar e enfermidades sistêmicas em mulheres na pós-menopausa. *Rev. Gauch. Odontol.* 2008;56(2):127-30.
28. Dawes C. How much saliva is enough for avoidance of xerostomia? *Caries Res.* 2004;38(3):236-40. doi: 10.1159/000077760.