International Medical Case Reports Journal

Dovepress
open access to scientific and medical research

Open Access Full Text Article

CASE REPORT

# Severe Xerostomia Induced by Multiple Systemic Diseases in a Patient with Psoriasis Vulgaris: A Case Report and Literature Review

Yessy Novianti[1], Wahyu Hidayat[2], Desi Elvhira Rosa[1]

[1]Oral Medicine Residency Program, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia; [2]Department of Oral Medicine, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

Correspondence: Yessy Novianti, Faculty of Dentistry, Universitas Padjadjaran, Sekeloa Selatan Street No. 1, Bandung, 40132, Indonesia, Tel +6281368429045, Email yessy21001@mail.unpad.ac.id



**Introduction:** Psoriasis is a complex autoimmune disease associated with chronic systemic keratinization and inflammation, which can affect the skin, joints, and oral cavity. Xerostomia is a subjective feeling of oral dryness that impairs patient comfort and lowers the quality of life. The aim of this case report is to describe the clinical mechanism of xerostomia in a psoriasis patient with multiple systemic diseases.

**Case Report:** A 51-year-old inpatient man with psoriasis vulgaris was referred to the Oral Medicine Department with complaints of difficulty swallowing due to a sore throat and dry tongue since last week. The patient had psoriasis vulgaris 15 years ago, chronic adrenal insufficiency, psoriatic arthritis, acute circulatory collapse, anemia of inflammation, acute kidney injury, dehydration, gastritis, urinary tract infections, and malnutrition. A complete anamnesis and oral examination were done. The patient was diagnosed with severe xerostomia, a fissured tongue, exfoliative cheilitis, angular cheilitis, and gingivitis by the Oral Medicine Department.

**Case Management:** The patient was treated with petroleum jelly, chlorine dioxide mouthwash, miconazole cream, and benzydamine HCl lozenges.

**Conclusion:** Based on case reports and reviews, multiple systemic diseases may not only increase the risk of xerostomia but also aggravate its severity.

**Keywords:** acute kidney injury, inflammation, nitrogen oxide, psoriasis arthritis, SXI-ID

## Introduction

Psoriasis is derived from the Greek words "psora", meaning itch, and "iasis", meaning action or condition.[1–3] Psoriasis is an autoimmune disease characterized by skin inflammation, epidermal hyperplasia, an increased risk of arthritis, cardiovascular morbidity, and psychosocial problems.[1–3] Psoriasis is a chronic, non-contagious skin disorder that presents as well-circumscribed erythematous plaques—rough, caked, silvery-white squamous plaques mainly on the scalp, elbows, knees, feet, body, and nails.[3–6] The etiology of psoriasis is unknown, but it is thought to be related to genetics, autoimmune diseases, and environmental factors.[3,5,7]

The prevalence of psoriasis in various countries ranges from 0.09% to 11.4%.[7] Psoriasis may occur at any age, especially between the ages of 15 and 30.[3] There are five types of psoriasis: psoriasis vulgaris, intertriginous psoriasis, guttate psoriasis, pustular psoriasis, and erythrodermic psoriasis.[3,5,7,8] Psoriasis vulgaris is the most common type of psoriasis seen in 90% of patients.[3,9] A commonly seen manifestation of extracutaneous psoriasis is arthritis in 40% of patients.[3,10,11]

Psoriasis may be associated with other diseases or comorbidities, including oral cavity involvement.[12] Oral psoriasis is a rare manifestation of psoriasis that may appear together with classic psoriasis, type vulgaris.[13] Oral psoriasis findings, such as geographic tongue, fissure tongue, and localized psoriasis plaques.[4,5,13–19] Oral psoriasis is usually asymptomatic,



Received: 3 December 2023
Accepted: 26 January 2024
Published: 31 January 2024

but some patients complain of discomfort, dry mouth, stinging, and even burning sensations, which can affect the patient's quality of life.[14]

Multiple factors may cause xerostomia, such as dehydration, aging, habits such as breathing through the mouth, smoking, alcohol, excessive caffeine consumption, systemic diseases, autoimmune diseases, xerogenic drugs, psychological conditions, head and neck radiotherapy, and malnutrition.[14,20–27] Autoimmune diseases can cause xerostomia, such as psoriasis in this case. Determining the etiology of xerostomia allows for an appropriate diagnosis and early intervention. Therefore, it is important to understand the factors that promote xerostomia in order to treat the underlying condition, alleviate symptoms, and prevent unwanted complications that can reduce the patient's quality of life.

This report presents the condition of severe xerostomia in a patient with psoriasis vulgaris and other systemic diseases. This case report aims to describe the clinical mechanism of xerostomia in a patient with psoriasis vulgaris. The presence of multiple systemic diseases affecting the patient's condition makes this report unique. This report also encompasses a review of 11 reported cases of xerostomia and summarizes the risk factors, systemic disease, and treatment options.

## Case Report

A 51-year-old inpatient man was referred to the Oral Medicine Department of Hasan Sadikin Bandung Hospital with difficulty swallowing due to a sore throat and dry mouth last week. The patient could not taste the food. He also complained of fever, weakness accompanied by cold sweat, blurred vision, weak extremities, itchy skin, redness, and body swelling. He was diagnosed with chronic adrenal insufficiency, severe psoriasis vulgaris with psoriatic arthritis, acute circulatory collapse, anemia of inflammation (AI), acute kidney injury (AKI) stage III, dehydration, gastritis related to drugs (methotrexate and cyclosporine), urinary tract infections, and malnutrition by the Dermatovenereology Department and the Internal Medicine Department. He was given 0.9% NaCl, ceftriaxone, omeprazole, metoclopramide, methotrexate, cetirizine, loratadine, folic acid, calcium, albumin, 5% dextrose, chlorpheniramine maleate, cefadroxil, and paracetamol.

According to his medical history, he has complained of reddish, scaly, itchy patches on his skin with a burning sensation on the scalp, nape, and knees since 15 years ago. He was diagnosed with psoriasis vulgaris by the Dermatovenereology Department and was treated with methylprednisolone. After the complaints of itching and redness on the skin subsided, he bought it himself and took the drug for 15 years without doctor monitoring. Four months before his hospitalization, he stopped taking medication on his own. He reported no history of other systemic diseases, such as hypertension or diabetes mellitus. He has no family history of having the same complaint. He denied a history of allergies to food, drugs, or other allergens.

The physical examination revealed a general state: looks moderately ill; consciousness: compos mentis; weight: 63 kg; height: 167 cm; blood pressure: 110/70 mmHg; pulse: 80 times/minute; respiration: 20 times/minute; body temperature: 36.5°C. Extra-oral examination revealed dry, scaly skin all over the body. He had joint stiffness. His face looked symmetrical, and the skin was scally, dry, and reddish (Figure 1A). The conjunctiva was anemic, and the sclera was non-icteric. The lips were dry and peeling, and there were painful fissures at both corners of the lips (Figure 1B). The nails appeared thickened with a ragged texture (Figure 1C). The submandibular and submental lymph nodes showed no abnormalities.

Intraoral examination revealed dryness and a glassy appearance of the oral mucosa, and the mouth mirror was adherent to the buccal mucosa (Figures 2A–D). The palate had a glassy appearance and was free of debris (Figure 2E). The tongue was erythematous, depapillated, and lobulated; two-thirds of the anterior dorsal tongue had shallow longitudinal fissures, and the mouth mirror stuck to the dorsal tongue (Figures 2F–H). The ventral tongue appeared glassy (Figure 2I). There was no saliva pooling on the floor of the mouth (Figure 2J). Plaque and calculus were present in all regions. A serological examination may be seen in Table 1. Based on anamnesis and clinical examinations, he was diagnosed with severe xerostomia (a score of 8 according to the Challacombe scale and a score of 17 according to the Indonesian Summated Xerostomia Inventory (SXI-ID) questionnaire), a fissured tongue, exfoliative cheilitis, angular cheilitis, and generalized chronic marginal gingivitis.

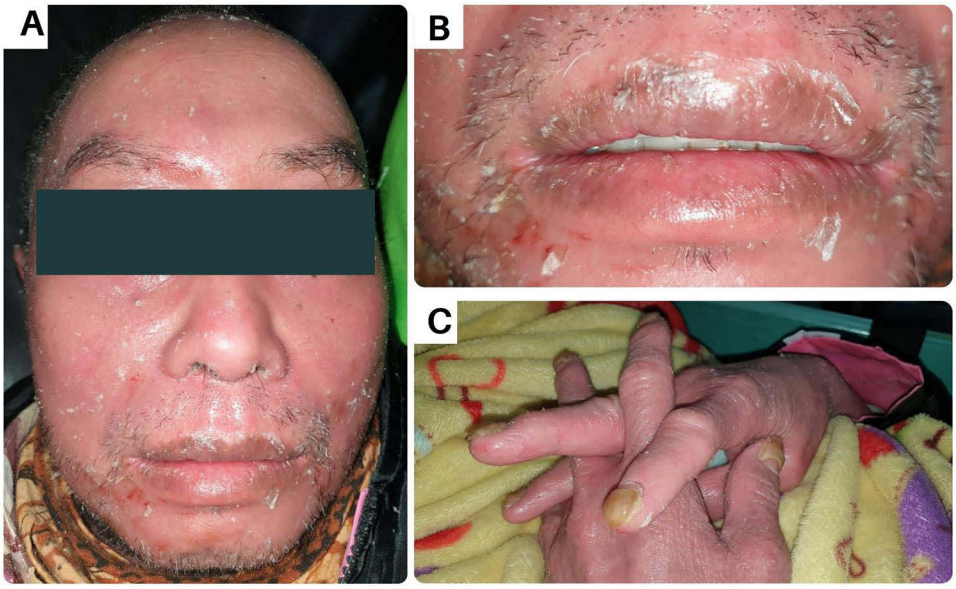


**Figure 1** Extraoral condition on the first visit; (**A**) Reddish and peeling skin on the face; (**B**) Dry and exfoliative lips; (**C**) Nail thickening and joints appearing stiff.

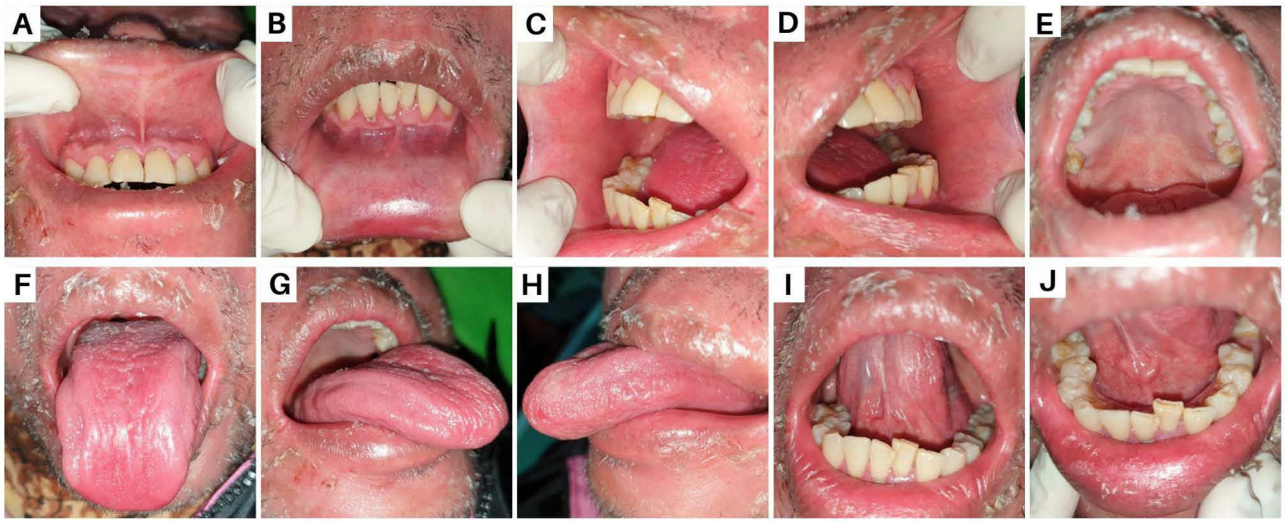


**Figure 2** The clinical appearance of intraoral dryness: (**A**) Upper labial mucosa; (**B**) Lower labial mucosa; (**C**) Right buccal mucosa; (**D**) Left buccal mucosa; (**E**) Palatum; (**F**) Tongue dorsum; (**G**) Right lateral tongue; (**H**) Left lateral tongue; (**I**) Tongue ventral; (**J**) Floor of the mouth.

The oral management of the patient was to apply a thin layer of petroleum jelly on the lips three times a day for exfoliative cheilitis, gargle with chlorine dioxide mouthwash three times a day for xerostomia, apply 2% miconazole cream two times a day for angular cheilitis, and suck benzydamine HCl lozenges three times a day for painful swallows. On the fifth day of his hospitalization, the patient developed respiratory distress and was diagnosed with hospital-acquired pneumonia (HAP). On the sixth day of his hospitalization, he had decreased consciousness, and his condition deteriorated. The patient's family refused to have him intubated and transferred him to the Intensive Care Unit (ICU), and the patient passed away.

## Discussion

Xerostomia was first introduced by Bartley in 1968. It is derived from the Greek "xeros", which means dry, and "stoma", which means mouth. Synonyms for xerostomia are oligosalia or stomatitis sicca.[8,28,29] Xerostomia is a subjective feeling

**Table 1** Serological Examination Result

| Test | Day 1 | Day 2 | Day 3 | Day 4 | Reference Value | Unit |
|---|---|---|---|---|---|---|
| Hemoglobin | 11.1 L | 9.0 L | 9.3 L | 8.6 L | 14–17.4 | g/dL |
| Hematocrit | 34.0 L | 27.7 L | 28.7 L | 25.9 L | 41.5–50.4 | % |
| Erythrocytes | 3.82 L | 3.07 L | 3.23 L | 2.93 L | 4.5–5.9 | $10^6$/µL |
| Leucocytes | 15.64 H | 15.67 L | 17.82 H | 13.65 H | 4.4–11.3 | $10^3$/µL |
| Thrombocytes | 394 N | 288 N | 263 N | 179 N | 150–450 | $10^3$/µL |
| Basophil | 0 N | 0 N | 0 N | 0 N | 0–1 | % |
| Eosinophil | 35 H | 34 H | 40 H | 24 H | 0–4 | % |
| Neutrophil bands | 1 L | 0 N | 0 N | 1 L | 3–5 | % |
| Neutrophil segmented | 35 L | 31 L | 29 L | 54 N | 45–73 | % |
| Lymphocytes | 21 N | 29 N | 22 N | 17 L | 18–44 | % |
| Monocytes | 8 N | 6 N | 9 H | 4 N | 3–8 | % |
| Total Neutrophil | 5.63 N | 4.86 N | 5.17 N | 7.51 H | 1.31–6.71 | $10^3$/µL |
| Total Lymphocytes | 3.28 H | 4.54 H | 3.92 H | 2.32 N | 0.9–3.22 | $10^3$/µL |
| Total Monocytes | 1.25 H | 0.94 H | 1.60 H | 0.55 N | 0.12–0.62 | $10^3$/µL |
| Total Eosinophil | 5.47 H | 5.33 H | 7.13 H | 3.28 H | 0.00–0.30 | $10^3$/µL |
| Total Basophil | 0.00 L | 0.00 L | 0.00 L | 0.00 L | 0.01–0.09 | $10^3$/µL |
| MCV | 89.0 N | 90.2 N | 88.9 N | 88.4 N | 80–96 | fL |
| MCH | 29.1 N | 29.3 N | 28.8 N | 29.4 N | 27.5–33.2 | Pg |
| MCHC | 32.6 L | 32.5 L | 32.4 L | 33.2 L | 33.4–35.5 | % |
| Glucose | 76 N | 57 N | | 124 N | <140 | mg/dL |
| Total Protein | 4.0 L | | | | 6.4–8.3 | g/dL |
| Albumin | 1.50 L | 1.70 L | | 1.30 L | 3.5–5.2 | g/dL |
| Urea | | 18.2 N | | 33.6 N | 18–55 | mg/dL |
| Creatinine | | 1.64 H | | 3.18 H | 0.72–1.25 | mEq/L |
| Sodium (Na) | 143 N | 149 H | | 153 H | 135–145 | mEq/L |
| Potassium (K) | 4.3 N | 3.9 N | | 3.8 N | 3.5–5.1 | mEq/L |
| Chloride (Cl) | 111 H | 125 HH | | 127 HH | 98–109 | mEq/L |
| AST | | 94 H | | | 15–37 | U/L |
| ALT | | 22 N | | | 0–55 | U/L |
| Anti-HIV | | NR | | | NR | NR |
| ANA | | NR | | | NR | |

**Abbreviations**: H, high; HH, very high; N, normal; L, low; R, reactive; NR, non-reactive; MCH, Mean corpuscular hemoglobin; MCHC, Mean corpuscular hemoglobin concentration; MCV, Mean corpuscular volume; AST, Aspartate aminotransferase; ALT, Alanine aminotransferase; HIV, Human immunodeficiency virus; ANA, Anti-nuclear antibodies test.

of oral dryness and may be determined by questioning the individual's perception of oral dryness. Clinicians often use the terms xerostomia and hyposalivation. Hyposalivation is an objective condition that refers to a lower salivary flow rate than normal, which may or may not be accompanied by xerostomia.[5,14]

Patients with xerostomia have difficulty speaking, chewing, swallowing, tasting, and digesting, leading to weight loss.[14] Xerostomia is associated with an increased risk of dental caries and bacterial and fungal infections in the oral cavity, affecting inpatients' healing processes. Xerostomia not only has an impact on general health but also has a significant impact on the quality of life, both socially and emotionally.[14,20,30–33] The etiology of xerostomia is multifactorial, including local factors, psychogenic factors, and underlying disease.[4,14]

This patient complained of dry mouth, sore tongue, and difficulty eating. The patient was then asked to complete the SXI-ID questionnaire prior to the clinical examination. The SXI-ID is used by health services in Indonesia for the early detection of xerostomia. A score of over 11 on the SXI-ID questionnaire indicates xerostomia.[34] The SXI-ID score on this patient was 17, indicating xerostomia. The intraoral examination revealed that the mouth mirror was stuck to the buccal mucosa and dorsum of the tongue, there was no saliva pooling at the floor of the mouth, the tongue was depapillated, the gingiva was smooth, the oral mucosa and palate looked shiny, the tongue had fissures, and the patient had cervical caries. Based on these clinical findings, the patient was diagnosed with severe xerostomia with a Challacombe scale score of 8.

The patient was diagnosed with severe psoriasis vulgaris with psoriatic arthritis, chronic adrenal insufficiency, acute circulatory collapse, anemia of inflammation (AI), stage III acute kidney injury (AKI), dehydration, gastritis related to drugs (methotrexate and cyclosporine), urinary tract infections, and malnutrition by the Dermatovenereology Department and the Internal Medicine Department. Another possibility that could be explored during the anamnesis of dry mouth in this patient may be Sjögren's syndrome, although the patient only complained of the oral region without genital and eye involvement. Further examination for Sjögren's syndrome itself is needed but has not been done because the patient has passed away. The multiple systemic diseases in this patient may contribute to the xerostomia. Recognition of the multifactorial causes of xerostomia allows for an accurate diagnosis and more effective treatment.[35]

Psoriasis vulgaris is the most common form of psoriasis. Clinically, the skin appears as thick, well-demarcated erythematous plaques of various sizes covered by silvery scales.[36,37] In addition to the skin, psoriasis manifestations can involve the ocular, nail, joint, and oral cavity.[2] Cutaneous psoriasis can appear before, during, or after an attack of psoriatic arthritis, with symptoms of joint stiffness, swelling, and pain.[36]

Psoriasis with oral involvement is still controversial and cases are rarely reported. The main clinical features most commonly seen in psoriasis patients are a fissured tongue and a geographic tongue.[10,12,13,16–19,36,38–40] The diagnosis of oral psoriasis is made when the clinical course of skin lesions coincides with oral lesions, which should preferably be confirmed histopathologically.[15,16,19,40] The manifestations of oral psoriasis in this patient were severe xerostomia, diffuse–type fissured tongue, exfoliative cheilitis, angular cheilitis, gingivitis, and periodontitis.

A recent study has shown salivary gland dysfunction and psoriasis vulgaris are directly related.[41] Salivary gland dysfunction in psoriasis vulgaris patients is caused by inflammation and nitrosative stress. The inflammatory effect of psoriasis vulgaris may injure the salivary glands, affect saliva production, and increase the risk of xerostomia.[41] The pathophysiology of psoriasis involves a chronic systemic inflammatory process that not only affects the skin but also the salivary glands. The salivary gland responds to the inflammation by increasing the amount of nitrogen oxide (NO) and peroxynitrate production as strong pro-apoptotic agents. Apoptosis of salivary gland structures can affect salivary gland function. The pro-apoptotic effect of NO on salivary glands leads to a reduction in salivary secretion. NO may inhibit the production of adenosine triphosphate (ATP), which is necessary to maintain anabolic processes in cells. As the amount of NO increases, an ATP deficiency occurs, which also disrupts the turnover mechanism of damaged cellular elements.[41–43]

Psoriasis patients had chronic inflammation characterized by increased levels of C-reactive protein (CRP) and levels of inflammatory cytokines, including tumor necrosis factor-α (TNF-α), interferon-gamma (IFN-$\gamma$), interleukin-2 (IL-2), interleukin-17 (IL-17), and interleukin-23 (IL-32).[2,44,45] TNF- α and IL-2 stimulate the production of metalloproteinases (MMPs), which can alter the structure of the salivary gland basement membrane. Excessive MMP production can damage the acinar basement cell membrane interactions and decrease the number of secretory units (acini and ducts). Salivary gland dysfunction occurs in psoriasis patients with a long duration of disease.[41]

Salivary gland dysfunction indicates reduced salivation (hyposalivation) or other quantitative changes in salivary secretion.[14] Xerostomia is the perception of oral dryness caused by reduced or absent saliva flow.[4,46] Salivary gland dysfunction can be physiological or pathological. Salivary glands are involved due to multiple systemic diseases, with the resulting complication of xerostomia.[14,47] According to the literature, the underlying diseases that can cause xerostomia include endocrine diseases (diabetes mellitus, thyroid disease, adrenal gland disorders), viral infections (human immunodeficiency virus, Epstein-Barr virus, hepatitis C virus, cytomegalovirus, human T-lymphotropic virus type 1), bacterial infections (tuberculosis, actinomycosis), autoimmune diseases (rheumatoid arthritis, systemic lupus erythematosus, primary biliary cirrhosis, scleroderma, psoriasis), sarcoidosis, hemochromatosis, amyloidosis, kidney disease, ectodermal dysplasia, chronic graft-versus-host disease, and Parkinson's disease.[14,21,24,35,47–56]

The patient was diagnosed with chronic adrenal insufficiency, most commonly caused by the long-term use of exogenous corticosteroids. Adrenal insufficiency associated with a deficiency of all adrenocortical hormones (aldosterone, cortisol, and androgens) may increase the risk of xerostomia. Mechanisms of xerostomia associated with adrenal insufficiency include dehydration due to excessive sweating and salivary gland hypofunction due to adrenal conditions.[52,57] Endocrine disease and skin disease can lead to systemic collagen disease or metabolic disorders that may be a cause of salivary gland disease.[58]

Anemia of inflammation (AI) in this patient may raise the risk of xerostomia due to changes in the epithelial tissue and oral mucous membranes.[59,60] Anemia reduces the oxygen-carrying capacity of the blood and leads to tissue hypoxia. AI, also known as anemia of chronic disease, is the most common type of anemia seen in hospitalized patients with chronic diseases. Common oral manifestations of anemia are angular cheilitis, depapilation of the tongue, pallor of the oral mucosa, and a burning sensation, which is found in this patient.[61] These oral findings are due to impaired cellular immunity, poor bactericidal activity of polymorphonuclear leukocytes, an inadequate antibody response, and epithelial abnormalities.[14] The laboratory test results in Table 1 show the patient's anemia; the red blood cell count has decreased.

The condition of the oral cavity is directly related to kidney disease. One of the most common oral conditions in patients with kidney disease is xerostomia. The prevalence of xerostomia ranges from 33–56% in patients with kidney disease, compared to 0–29% in controls without kidney disease.[14] The mechanisms of xerostomia in patients with kidney disease are decreased fluid intake, polyuria, stress, and salivary gland dysfunction. Many elderly patients with kidney disease tend to drink less, combined with a reduced ability of the kidneys to reabsorb sodium and polyuria, resulting in fluid loss and an increased risk of xerostomia. Stress and depression may reduce salivary gland activity in patients with kidney disease. Changes in the chemical composition of saliva, fibrosis, atrophy of minor salivary glands, and cell damage in the salivary glands contribute to an increased risk of xerostomia in patients with kidney disease.[14]

Cardiovascular disease (CVD) and kidney disease are closely related, and disease of one organ causes dysfunction of the other, ultimately leading to the failure of both organs.[14,62] Acute Kidney Injury (AKI) is strongly linked to the progression of CVD.[62] The risk of xerostomia may be raised by the underlying disease, such as cardiovascular disease and renal disease, or by the drug intake for the disease.[14,21,24,52–54]

The patient was diagnosed with moderate dehydration, which was exacerbated by low intake, increasing the risk of xerostomia. Dehydration is also an indirect causative factor for xerostomia.[58] Individual hydration levels may interfere with salivary secretion.[63] When the body is dehydrated, salivary flow decreases because the salivary glands reduce secretion to maintain the amount of water in the body.[58] When the body's water content is reduced by 8%, salivary flow is almost zero. Even during dehydration, the salivary glands stop secreting saliva to conserve water.[63]

Decreased fluid intake, impaired thirst mechanisms, and xerogenic drugs or beverages (alcohol and caffeine) can lead to dehydration.[58] Clinical signs of dehydration include oral and nasal dryness and longitudinal fissures on the tongue dorsum. If systemic dehydration is suspected, patients should be asked about their daily fluid intake and urine output (taking dehydrating beverages such as coffee and alcohol), their daily sodium intake, and xerogenic medications such as diuretics, laxatives, and antihistamines.[14]

Malnutrition may be a consequence of this patient's underlying disease, gastritis. Malnutrition may also increase the risk of xerostomia. The changes in nutrition and deficiencies may affect salivary function. An increase in salivary protein could result from a modest decrease in daily calorie intake, whereas severe caloric restrictions reduce salivary flow, cell

**Table 2** Review of Xerostomia Case Reports

| No. | Researcher & Country | Age | Sex | Oral Diagnosis | Risk Factors | Systemic/ Underlying Disease | Treatment | Outcome |
|---|---|---|---|---|---|---|---|---|
| 1 | Nugraha, et al 2019. Indonesia[68] | 66 | F | Xerostomia, oral ulcer, geographic tongue, dental caries. | Psychological stress; menopause history. | Psychological aspects | Mouthwash containing stabilized Chlorine Dioxide | Salivary flowrate increased. |
| 2 | Bokkasam, et al 2020. India[69] | 52 | F | Radiation-induced xerostomia, radiation-induced fibrosis | Radiotherapy and chemotherapy | Carcinoma of buccal mucosa | TENS | Salivary flowrate increased. |
| | | 58 | M | Radiation-induced xerostomia, radiation-induced fibrosis, caries | Radiotherapy | Carcinoma of tongue | | |
| 3 | Fathi, et al 2021. Iran[70] | 42 | F | Xerostomia | Medication (Atazanavir, azithromycin, vancomycin, salbutamol, heparin) | COVID-19 | COVID-19 treatment plan | Remission of the xerostomia |
| | | 33 | M | | Medication (Ribavirin, heparin, salbutamol, prednisone) | COVID-19 | | |
| | | 19 | F | | Medication (Pantoprazole, ribavirin, azithromycin, ceftriaxone, dextromethorphan) | Gastroesophageal reflux disease, COVID-19 | | |
| | | 49 | M | | Medication (Meropenem, heparin, salbutamol, promethazine, IFN) | COVID-19 | | |
| | | 48 | F | | Medication (Ceftriaxone, heparin, ribavirin, amlodipine) | PUD, COVID-19 | | |
| | | 49 | F | | Medication (Omeprazole, heparin, salbutamol, IFN, ribavirin, meropenem, hydroxychloroquine) | PUD, COVID-19 | | |
| | | 29 | M | | Smoking; Medication (Salbutamol, azithromycin, IFN, hydroxychloroquine, meropenem) | COVID-19 | | |
| | | 35 | F | | Medication (Heparin, IFN, hydroxychloroquine, meropenem, prednisone) | COVID-19 | | |
| | | 38 | M | | Medication (Heparin, salbutamol, ribavirin, hydroxychloroquine, meropenem) | COVID-19 | | |
| | | 34 | M | | Medication (Hydroxyzine, ceftriaxone, loperamide, apotel, expectorant) | Allergy, COVID-19 | | |

(*Continued*)


https://doi.org/10.2147/IMCRJ.S453097 DovePress

**Table 2** (Continued).

| No. | Researcher & Country | Age | Sex | Oral Diagnosis | Risk Factors | Systemic/ Underlying Disease | Treatment | Outcome |
|---|---|---|---|---|---|---|---|---|
| 4 | Christine, et al 2021. Indonesia[71] | 58 | M | Severe xerostomia, oral candidiasis | Multiple medication (ampicillin, sulbactam, captopril, omeprazole, vitamin B6, gabapentin, furosemide, dobutamine) | Valvular Heart Disease | Chlorine dioxide containing lemon and zinc; nystatin | Improvement of oral conditions |
| 5 | Oliveira, et al 2021. Brazil[72] | 7 | F | Xerostomia, trismus, dental caries, malocclusion | None | Systemic scleroderma | Photobiomodulation therapy | Salivary flowrate increased and remission of the xerostomia |
| 6 | Tan, et al 2022. Australia[73] | 60 | F | Xerostomia, Fissure tongue, glossitis | Vaccination with a COVID-19 vaccine (BNT162b2) | Hypercholesterolemia, visual impairment, uterine fibroids, allergy (Bactrim), | Prednisolone | Improvement in xerostomia |
| 7 | Zhu, et al 2022. China[74] | 4 | F | Xerostomia, dental caries | None | LADD | Chewing sugar-free gum, rinsing with artificial saliva, and keeping the mouth clean | No dry mouth |
| 8 | Barros, et al 2023. Brazil[72] | 55 | F | Severe xerostomia | Psychiatric medication (fluoxetine); daily drugs (simvastatin, fenofibrate) | Psychological aspects | Photobiomodulation therapy | Improvement in xerostomia |
| 9 | Sharma, et al 2023. India[75] | 11 | M | Xerostomia, oral chronic hyperplastic candidiasis | Chemotherapy (Vincristine, doxorubicin and cyclophosphamide) | Ewing's sarcoma of Ethmoid sinus | Xylitol gum, frequent sips of water, sucralfate, topical fluoride, clotrimazole, fluconazole | At 5-week follow up, reduction in burning sensation and resolution of white lesion was noted. |
| 10 | Moussa, et al 2023. USA[76] | 85 | F | Chronic xerostomia | Polyuria, medication (amlodipine, aspirin, atenolol, acetaminophen, restasis) | Sjogren's syndrome, acute spontaneous dislocation of the hip, hyponatremia, joint deformities | Acetaminophen-hydrocodone, celecoxib, gabapentin, and Toradol | Not mention |
| 11 | Putri, et al 2023. Indonesia[77] | 45 | M | Xerostomia | Smoking, drinking alcohol, multiple drug (Tenofovir and Lamivudine, Fructus Schisandra, Risperidone, Divalproex sodium, Escitalopram oxalate, and Clozapine) | HIV, schizoaffective disorder, and Hepatitis C | 0.9% sodium chloride mouthwash every two hours per day, increase fluid intake up to 10 glass a day, and advised to stop smoking cigarettes and drinking alcoholic beverages. | Not mention |

**Abbreviations**: F, Female; M, Male; TENS, Transcutaneous electrical nerve stimulation; PUD, Peptic ulcer disease; LADD, Lacrimo-auriculo-dento-digital syndrome; HIV, human immunodeficiency virus.


https://doi.org/10.2147/IMCRJ.S453097 DovePress

numbers, and salivary composition.[64] Another study described that individuals with xerostomia were found to have poor nutrition.[51]

Other possible factors that influence the xerostomia in this patient include drugs. Side effects of medication can cause xerostomia.[14] There is evidence that taking numerous drugs may increase the risk of xerostomia.[47] Xerostomia in this patient may be caused by using methotrexate, cetirizine, loratadine, chlorpheniramine maleate, and omeprazole.[4,5,8,14,65,66]

The multiple systemic diseases may contribute to the severity of xerostomia in this patient. The complications of systemic diseases in these patients may affect psychological conditions, cause emotional stress, and increase the risk of xerostomia. The systemic diseases may affect the patient's ability to clean the oral cavity. The systemic diseases may worsen the patient's condition, impede healing, and increase comorbidities.[41,67]

After taking the prescribed medications for three days, the patient's son claimed that his father was able to swallow food. Unfortunately, the patient developed septic shock due to hospital-acquired pneumonia (HAP) after five days in the hospital and eventually passed away. The patient's son agreed and signed an informed consent form before this case report's publication. The institution also consented to the publication of this case report.

## Literature Review

For a better understanding of the factors that promote xerostomia, this case report also provides a review of other xerostomia cases that have been published between 2019 and 2023. The knowledge of the possible risk factors related to xerostomia is greatly enhanced by this review. Eleven cases of xerostomia were found and summarized in Table 2.

The results of the literature search yielded 3 articles from Indonesia,[68,71,77] 2 articles from India,[69,75] 2 articles from Brazil,[72] 1 article from Iran,[70] 1 article from Australia,[73] 1 article from China,[74] and 1 article from the USA.[76] The age range of the reported xerostomia patients was the youngest at 7 years and the oldest at 85 years. The most reported patients in the literature review were 12 females and 9 males.

Based on the results of the literature review, factors that can affect xerostomia conditions include psychological stress, menopause, radiotherapy, chemotherapy, medication, COVID-19 vaccination, smoking, drinking alcohol, polyuria, and underlying diseases (carcinoma, COVID-19, gastroesophageal reflux disease, peptic ulcer disease, allergies, valvular heart disease, systemic scleroderma, hypercholesterolemia, Ewing's sarcoma, Sjögren's syndrome, hyponatremia, lacrimo-auriculo-dento-digital syndrome, human immunodeficiency virus, schizoaffective disorder, and hepatitis C). Patients with xerostomia who have systemic disease require collaboration with other disciplines besides oral medicine for successful treatment. Nine of the eleven case report articles in the review reported successful treatment.

## Conclusion

Multiple systemic diseases may increase the risk and severity of xerostomia in this psoriasis patient. Multiple systemic diseases could affect xerostomia conditions such as, carcinoma, COVID-19, gastroesophageal reflux disease, peptic ulcer disease, allergies, valvular heart disease, systemic scleroderma, hypercholesterolemia, Ewing's sarcoma, Sjögren's syndrome, hyponatremia, lacrimo-auriculo-dento-digital syndrome, human immunodeficiency virus, schizoaffective disorder, and hepatitis C.

## Acknowledgments

The authors would like to express our sincere gratitude to our patient and his family for their consent and those who have worked and helped us at Dr. Hasan Sadikin Hospital Bandung. The Universitas Padjadjaran directorate of research and community service is also gratefully acknowledged by the authors for its financial support.

## Disclosure

The authors report no conflicts of interest in this work.

## References


1. Owczarczyk-Saczonek A, Purzycka-Bohdan D, Nedoszytko B, et al. Pathogenesis of psoriasis in the "omic" era. Part III. Metabolic disorders, metabolomics, nutrigenomics in psoriasis. *Postep Dermatologii i Alergol*. 2020;37(4):452–467. doi:10.5114/ada.2020.98284
2. Jiménez C, Bordagaray MJ, Villarroel JL, et al. Biomarkers in oral fluids as diagnostic tool for psoriasis. *Life*. 2022;12(4):1–12. doi:10.3390/life12040501
3. Sewon K, Masayuki A. Fitzpatrick's Dermatology; 2019.
4. Farah C, Balasubramaniam R, Mccullough MJ. *Contemporary Oral Medicine*. Springer Nature; 2019; doi:10.1007/978-3-319-72303-7
5. Ongole R, P BN. *Textbook of Oral Medicine, Oral Diagnosis and Oral Radiology*. 2nd ed. Elsevier; 2013.
6. Vičić M, Kaštelan M, Brajac I, Sotošek V, Massari LP. Current concepts of psoriasis immunopathogenesis. *Int J Mol Sci*. 2021;22:1–14. doi:10.3390/ijms222111574
7. World Health Organization psoriasis. Global report on. *Glob Rep Psoriasis*. 2016;978:1–26.
8. Ghom AG, Mhaske S. *Textbook of Oral Pathology*. 2nd ed. Jaypee Brothers Medical Publishers; 2013.
9. Griffiths CE, Barker JN. Pathogenesis and clinical features of psoriasis. *Lancet*. 2007;370:263–271. doi:10.1016/S0140-6736(07)61128-3
10. Ulmansky M, Michelle R, Azaz B. Oral psoriasis: report of six new cases. *J Oral Pathol Med*. 1995;24(1):42–45. doi:10.1111/j.1600-0714.1995.tb01128.x
11. FitzGerald O, Ogdie A, Chandran V, et al. Psoriatic arthritis. *Nat Rev Dis Primers*. 2021;7(1). doi:10.1038/s41572-021-00293-y
12. Ligia MG, Leira S, Constanza R, et al. Psoriasis vulgaris: relationship between oral and periodontal conditions and disease severity. *Open Dermatol J*. 2019;13(1):47–54. doi:10.2174/1874372201913010047
13. Moccia R, Zhang L. Review of oral psoriasis. *Psoriasis Forum*. 2014;20:1.
14. Glick M, Greenberg MS, Lockhart PB, Challacombe SJ. *Burket's Oral Medicine*. 13th ed. John Wiley & Sons Inc; 2021.
15. Ali hassan S, Bhateja S. Psoriasis of oral cavity- A review. *IP Indian J Clin Exp Dermatology*. 2020;6(2):113–116. doi:10.18231/j.ijced.2020.024
16. Richardson LJ, Kratochvil FJ, Zieper MB. Unusual palatal presentation of oral psoriasis. *J Can Dent Assoc*. 2000;66(2):80–82.
17. Rajguru JP, Deepthi M, Kumar D, Suri P, Shweta Bhardwaj NDP, Patel N. Update on psoriasis: a review. *J Fam Med Prim Care*. 2020;9(1):20–24. doi:10.4103/jfmpc.jfmpc_689_19
18. Venugopal DC, S S, Narasimhan M. A rare case of intraoral psoriasis. *Cureus*. 2019;11(7):1–8.
19. Bouslama G, Hasni W, Massoud Ben NS, Youssef S, Boughzela A. Isolated lip involvement in psoriasis: an uncommon aspect of a common dermatologic condition. *J Oral Med Oral Surg*. 2018;24(2):89–92. doi:10.1051/mbcb/2017034
20. Kapourani A, Kontogiannopoulos KN, Barmpalexis P. A review on the role of pilocarpine on the management of xerostomia and the importance of the topical administration systems development. *Pharmaceuticals*. 2022;15(6):762. doi:10.3390/ph15060762
21. Napeñas JJ, Brennan MT, Fox PC. Diagnosis and treatment of xerostomia (dry mouth). *Odontology*. 2009;97(2):76–83. doi:10.1007/s10266-008-0099-7
22. Walsh LJ. Dry mouth: a clinical problem for children and young adults. *Int Dent South Africa*. 2007;9(5):48–56.
23. Han P, Suarez-Durall P, Mulligan R. Dry mouth: a critical topic for older adult patients. *J Prosthodont Res*. 2015;59(1):6–19. doi:10.1016/j.jpor.2014.11.001
24. Frydrych AM. Dry mouth: xerostomia and salivary gland hypofunction. *Aust Fam Physician*. 2016;45(7):488–492.
25. Aflaki E, Erfani T, Manolios N, Schifter M. An approach to the patient with a dry mouth. *Med Today*. 2014;15(4):30–37.
26. Sujatha S, Priyadharshini RRA. Dry mouth: an emerging epidemic. *J Datta Meghe Inst Med Sci Univ*. 2019;14(3):276–280. doi:10.4103/jdmimsu.jdmimsu
27. de Campos WG, Esteves CV, Costa K, de Andrade ACP, Domaneschi C, Lemos CA. Xerostomia in the older adult population, from diagnosis to treatment. *Clin Lab Res Dent*. 2019;1–7. doi:10.11606/issn.2357-8041.clrd.2019.157759
28. Bossola M. Xerostomia in patients on chronic hemodialysis: an update. *Semin Dial*. 2019;32(5):467–474. doi:10.1111/sdi.12821
29. Kim YJ. Xerostomia and Its Cellular Targets. *Int J Mol Sci*. 2023;24(6):5358. doi:10.3390/ijms24065358
30. Choi Seok J. Xerostomia: an Overview. *Preprints*. 2020;2020:1.
31. Folke S, Paulsson G, Fridlund B, Söderfeldt B. The subjective meaning of xerostomia—an aggravating misery. *Internat J Qualitat Stud Health Well Being*. 2009;4(4):245–255. doi:10.3109/17482620903189476
32. D'Agostino C, Elkashty OA, Chivasso C, Perret J, Tran SD, Delporte C. Insight into salivary gland aquaporins. *Cells*. 2020;9(6):1–23. doi:10.3390/cells9061547
33. Ristevska I. Xerostomia: understanding the diagnosis and the treatment of dry mouth. *J Fam Med Dis Prev*. 2015;1(2):1–5. doi:10.23937/2469-5793/1510008
34. Dwipa L, Wardhani R, Setiani T, Sufiawati I, Pratiwi YS. Summated Xerostomia inventory to detect both xerostomia and salivary gland hypofunction. *Eur Rev Med Pharmacol Sci*. 2023;27:517–523. doi:10.26355/eurrev_202301_31052
35. M H, B M, Khodadoustan A. Xerostomia due to systemic disease: a review of 20 conditions and mechanisms. *Ann Med Health Sci Res*. 2014;4(4):503. doi:10.4103/2141-9248.139284
36. Fatahzadeh M. Manifestation of psoriasis in the oral cavity. *Quintessence Int*. 2016;47(3):241–247. doi:10.3290/j.qi.a35264
37. Nuroctaviani LE, Tjiahyono E. Psoriasis Vulgaris; 2022:547–553.
38. Ferris WJ, Mikula S, Brown R, Farquharson A. Oral psoriasis of the tongue: a case report. *Cureus*. 2019;11(12):1–9.
39. Yesudian PD, Chalmers RJG, Warren RB, Griffiths CEM. In search of oral psoriasis. *Arch Dermatol Res*. 2012;304(1):1–5. doi:10.1007/s00403-011-1175-3
40. Khan S, Zaheer S, Gupta ND. Oral psoriasis: a diagnostic dilemma. *Eur J Gen Dent*. 2013;2(01):67–71. doi:10.4103/2278-9626.106822
41. Skutnik-radziszewska A, Maciejczyk M, Flisiak I, et al. Enhanced inflammation and nitrosative stress in the saliva and plasma of patients with plaque psoriasis. *J Clin Med*. 2020;9(3):1–17. doi:10.3390/jcm9030745
42. Chen C, Ren F, Lu T, et al. Involvement of salivary glands in regulating the human nitrate and nitrite levels. *Arch Oral Biol*. 2010;55(9):613–620. doi:10.1016/j.archoralbio.2010.05.016
43. Soinila J, Nuorva K, Soinila S. Nitric oxide synthase in human salivary glands. *Histochem Cell Biol*. 2006;125(6):717–723. doi:10.1007/s00418-005-0123-8

44. Pan HF, Li XP, Zheng SG, Ye DQ. Emerging role of interleukin-22 in autoimmune diseases. *Cytokine Growth Factor Rev*. 2013;24(1):51–57. doi:10.1016/j.cytogfr.2012.07.002
45. Tabarkiewicz J, Pogoda K, Karczmarczyk A, Pozarowski P, Giannopoulos K. The Role of IL-17 and Th17 lymphocytes in autoimmune diseases. *Arch Immunol Ther Exp*. 2015;63(6):435–449. doi:10.1007/s00005-015-0344-z
46. Fricton J, Rhodus N, Therapies C, Medicine O. Orofacial Disorders. *Curr Therap Orof Pain Oral Med*. 2017;2017:1. doi:10.1007/978-3-319-51508-3
47. Escobar A, Aitken-saavedra JP, Escobar A, Aitken-saavedra JP. Xerostomia: an update of causes and treatments. *Salivary Glands New Approach Diagnost Treat*. 2018. doi:10.5772/intechopen.72307
48. Zhao M. Xerostomia: the causes and clinical management including acupuncture and herbal medicine. *Arch Clin Med Case Reports*. 2022;06 (03):411–419. doi:10.26502/acmcr.96550492
49. Adolfsson A, Lenér F, Marklund B, Mossberg K, Çevik-aras H. Prevalence of dry mouth in adult patients in primary health care. *Acta Odontol Scand*. 2022;80(8):605–610. doi:10.1080/00016357.2022.2069282
50. Ito K, Izumi N, Funayama S, et al. Characteristics of medication-induced xerostomia and effect of treatment. *PLoS One*. 2023;18:1–14. doi:10.1371/journal.pone.0280224
51. Nuril F, Sutarjo A, Fathiya M, Gisela R, Brahmanikanya L. Common precipitating factors of xerostomia in elderly. *J Health Allied Sci NU*. 2023;2023:5.
52. Manikantan NS. Dhanya Balakrishnan, AD Manoj Kumar SPM. *Xerostomia*. 2017;8(2):126–130.
53. Niklander S, Veas L, Barrera C, Fuentes F, Chiappini G, Marshall M. Risk factors, hyposalivation and impact of xerostomia on oral health-related quality of life. *Braz Oral Res*. 2017;31:1–9. doi:10.1590/1807-3107BOR-2017.vol31.0014
54. von Bültzingslöwen I, Sollecito TP, Fox PC, et al. Salivary dysfunction associated with systemic diseases: systematic review and clinical management recommendations. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol*. 2007;103:S57.e1–S57.e15. doi:10.1016/j.tripleo.2006.11.010
55. Joanna N Di Y, Thomson WM. Dry mouth – an overview. *Singapore Dent J*. 2015;36:12–17. doi:10.1016/j.sdj.2014.12.001
56. Kapourani A, Kontogiannopoulos KN, Manioudaki AE, et al. A review on xerostomia and its various management strategies: the role of advanced polymeric materials in the treatment approaches. *Polymers*. 2022;14(5):850. doi:10.3390/polym14050850
57. Mravak-stipetić M. Xerostomia - Diagnosis and Treatment. *Medicinske znanosti*. 2012;38:61–68.
58. Sivapathasundharam B. Manual of salivary gland diseases; 2013.
59. Al–Nuaimy K, Al–Sandook T. Xerostomia: analysis among dental patients. *Al-Rafidain Dent J*. 2005;5(2):108–113. doi:10.33899/rden.2005.45488
60. Kotha R, Sudhakarareddy R, Alapati S. Correlation of anemia, xerostomia and its association with candidial colonization among postmenopausal women of different socioeconomic status in patients attending dental school in South India. *Int J Exp Dent Sci*. 2014;3(1):33–36. doi:10.5005/jp-journals-10029-1065
61. Anitha N, Appadurai P. Anemia and it's oral manifestation. *Eur J Mol Clin Med*. 2020;07(08):1716–1717.
62. Liu M, Li XC, Lu L, et al. Cardiovascular disease and its relationship with chronic kidney disease. *Eur Rev Med Pharmacol Sci*. 2014;18 (19):2918–2926.
63. Del Vigna P, De lima AAS, Machado MÂN, Grégio AMT, de Almeida PDV. Saliva composition and functions. *J Contemp Dent Pract*. 2008;9 (3):72–80. doi:10.5005/jcdp-9-3-72
64. Humphrey SP, Williamson RT. Saliva Review Pdf. *J Prosthet Dent*. 2001;85(2):162–169. doi:10.1067/mpr.2001.113778
65. Myers EN, Ferris RL. *Salivary Gland Disorders*. Philipp M ed.. Springer-Verlag; 2007.
66. Regezi Sciubba J. *Oral Pathology: Clinical Pathologic Correlations*. Elsevier; 2017.
67. Srivastava AK, Chand Yadav T, Khera HK, et al. Insights into interplay of immunopathophysiological events and molecular mechanistic cascades in psoriasis and its associated comorbidities. *J Autoimmun*. 2021;118:1–24.
68. Nugraha AP, Ernawati DS, Harijanti K, Parmadiati AE. Psychological stress induced xerostomia and hyposalivation: the case study in Indonesian female patient. *J Int Dent Med Res*. 2019;12(1):216–219.
69. Bokkasam V, Puchalapalli Y, Shaik S, et al. TENS in radiation induced xerostomia - case reports. *Int J Contemp Med Surg Radiol*. 2020;5 (2):2019–2021. doi:10.21276/ijcmsr.2020.5.2.12
70. Fathi Y, Hoseini EG, Atoof F, Mottaghi R. Xerostomia (dry mouth) in patients with COVID-19: a case series. *Future Virol*. 2021;16(5):315–319. doi:10.2217/fvl-2020-0334
71. Christine H, Dewi TS, Hidayat W. Management of severe xerostomia and oral candidiasis in patient with valvular heart disease: a case report. *Dentino J Kedokt Gigi*. 2021;6(2):209. doi:10.20527/dentino.v6i2.12008
72. De Oliveira AB, Ferrisse TM, Salomão KB, Miranda ML, Bufalino A, Brighenti FL. Photobiomodulation in the treatment of xerostomia associated with hyposalivation in a pediatric patient with systemic scleroderma. *Autops Case Reports*. 2021;11:1–5. doi:10.4322/acr.2020.220
73. Tan E, Salman S. Unusual case of painful glossitis and xerostomia following vaccination with Pfizer-BioNTech SARS-CoV-2 (BNT162b2). *Am J Case Rep*. 2022;23:1–5. doi:10.12659/AJCR.937212
74. Zhu H, Yu GY. Lacrimo-auriculo-dento-digital syndrome with AIRE mutation: a case report. *J Stomatol Oral Maxillofac Surg*. 2022;123(6):e988–e990. doi:10.1016/j.jormas.2022.07.014
75. Sharma H, Thimmaiah C, Binnal A, Golla MK, Suprabha BS. Vincristine, doxorubicin and cyclophosphamide chemotherapy induced oral chronic hyperplastic candidiasis and xerostomia in a young patient with Ewing's sarcoma: a case report. *Acta Marisiensis Ser Medica*. 2023;69(2):128–130. doi:10.2478/amma-2023-0018
76. El-Moussa A, Mohsin SU, Alrawi O, Yaseen O, Osman Malik Y. Recurrent hyponatremia in the setting of autoimmune disease with sicca syndrome: a case report. *Case Reports Nephrol Dial*. 2023;13:45–50. doi:10.1159/000530491
77. Putri AT. Multiple etiologies of xerostomia in an HIV positive patient. *Med Hutama*. 2023;49(1):154–168.