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Prevalence and factors associated with xerostomia in patients hospitalized due AIDS-related complications

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Abstract

Introduction: Xerostomia is a subjective sensation of dry mouth due to lack of saliva. The objective of this study was to investigate the prevalence and factors associated with the presence of hypo-salivation and xerostomia complaint in patients with human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS)-related complications.

Material and methods: One hundred and two adult subjects were divided into two groups (51 HIV-infected patients and 51 controls). Initially, subjects underwent oral examination and anamnesis. Afterwards, stimulated salivary flow and a questionnaire to evaluate the prevalence and intensity of xerostomia symptoms were utilized.

Results: The mean salivary flow was significantly lower in HIV-positive individuals compared with controls. Twenty-five (49%) patients with HIV infection experienced low salivary flow. The complaint of xerostomia was reported by 30 (59%) patients and 9 (18%) controls. The sensation of discomfort in the mouth, and difficulty in talking and eating had greater records of moderate to severe intensity in the case group. Of the total sample, 76% of individuals used antiretroviral therapy and other drugs capable of inducing hypo-salivation and, consequently, xerostomia.

Conclusions: Based on the results, it can be concluded that the prevalence of xerostomia among hospitalized patients due to AIDS complications is high. This fact may be associated with low salivary flow and the use of various drugs, including antiretroviral drugs.

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Key words: xerostomia, acquired immunodeficiency syndrome, saliva, salivation, drug-related side effects, adverse reactions.

Introduction

Xerostomia is defined as a subjective feeling of dry mouth. The main complaint of this condition includes the impression of a dry mouth, problems with food ingestion, and dryness of the oral mucosa and skin [1]. Xerostomia is primarily caused by the marked decrease in the function of salivary glands (hypo-salivation), and cannot be characterized as a disease. However, it can represent symptoms related to the presence of important systemic diseases [2, 3].

Hypo-salivation occurs when the salivary flow is very low and leads to the feeling of dry mouth. Initially, three factors need to be investigated: exposure of salivary glands to radiotherapy, chronic use of pharmacological agents, and some

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pathological conditions [4, 5]. The prevalence of moderate to severe dry mouth can reach up to 64% in patients treated by radiotherapy in the head and neck region [6].

According to the literature, more than 400 drugs can cause xerostomia as a side effect. Antihypertensives and antidepressants are the drugs most related to xerostomia [7]. Several diseases can be associated with reduced salivary flow and, consequently, xerostomia. Some diseases of the endocrine, autoimmune, infectious, and granulomatous nature can induce xerostomia [8]. Within the spectrum of infectious diseases, the following viral infections are associated with xerostomia: human immunodeficiency virus, human T-lymphotropic virus type 1, hepatitis C virus, cytomegalovirus, and Epstein-Barr virus.

The pathogenesis of human immunodeficiency virus (HIV) in the hypo-functioning of salivary glands and xerostomia is not yet fully understood. According to Meer [9], the destruction of salivary gland elements (acinar destruction) remains the most plausible reason for the loss of salivary function and the resulting xerostomia. On the other hand, there are authors who reported that the drugs used in highly active antiretroviral therapy (HAART) can impact salivary flow. López-Verdín *et al.* [10] observed that the salivary flow of patients using antiretroviral therapy was significantly lower when compared with healthy controls, and that 37.5% of patients undergoing HAART treatment experienced hypo-salivation. In addition, xerostomia was more frequent in individuals with higher viral load.

The prevalence of xerostomia in patients with advanced HIV infection is 30% [11]. However, it is known that other factors may be linked to hypo-salivation and dry mouth, such as medication use, smoking, and alcoholism [12, 13]. Clinically, patients with chronic hypo-salivation and xerostomia may have multiple oral and dental concerns, including dental caries, periodontal disease, fungal infections, ill-fitting dentures, and taste alterations [14].

Advances in antiretroviral therapy have led to a reduction in the prevalence of various oral diseases associated with HIV/acquired immunodeficiency syndrome (AIDS) infection. However, some authors have observed that the prevalence of HIV-associated salivary gland disease (HIV-SGD) has increased, especially in the adult population. Therefore, the aim of this study was to investigate the prevalence and factors associated with hypo-salivation and xerostomia in patients hospitalized due to complications of HIV infection.

Material and methods

Sample

One hundred and two adult individuals of both sexes were included in this research, and were divided into two groups: 1) case group, composed of 51 individuals diagnosed with HIV infection, and 2) control group, with 51 healthy controls.

Data collection

This study was approved by the Committee of Ethics in Research of the Universidade Federal do Paraná (protocol Number: 1.627.826). Data collection was performed among patients admitted to the Oswaldo Cruz Hospital, which is a reference center for the treatment of infectious diseases in the city of Curitiba (South of Brazil). All individuals signed a consent form authorizing their participation in the research. The following information were collected from their medical records: personal data, reason for hospitalization, comorbidities, CD4 count and time since HIV diagnosis, antiretroviral therapy, other medications use, and consumption of tobacco, alcohol, and illicit drugs. Patients of the case group were matched for gender and age with healthy controls.

Healthy patients were selected to join the control group at the School of Dentistry (Universidade Federal do Paraná – UFPR). After anamnesis, an oral exam was performed for each participant. All information were recorded on a clinical form, and all changes observed in teeth and mucous membranes were documented.

Samples of mechanically stimulated saliva were collected at the same time of day (9:00-11:00 am). Saliva collection was done in a standardized manner according to technique recommended by Navazesh [15]. Initially, each participant was instructed to chew a piece of latex for 1 minute. During this time, it was possible to swallow the produced saliva. Then, the researcher provided more precise guidance on the saliva collection to the participant, and proceeded to collect the saliva for 5 minutes.

Salivary flow analysis

Analysis of salivary flow was performed using gravimetric technique recommended by Banderas-Tarabay *et al.* [16], and each saliva sample was weighed with a precision scale (Bell Engenharia, Brazil). Then, the weight of sample was divided by the time of collection (5 minutes), and salivary flow was expressed in ml/minute. Hypo-salivation was considered when the speed of salivary flow was ≤ 0.6 ml/minute [17].

Analysis of xerostomia

Xerostomia was analyzed using xerostomia index of nine items adapted from methodology of Kaur *et al.* [18]. In addition, visual analogue scale was employed to determine the intensity of xerostomia symptoms (i.e., humidity, discomfort, speech, and food) according to López-Verdín *et al.* [10]. The analysis of responses was defined as: 0 = none, 1-3 = slight, 4-7 = moderate, and 8-10 = severe.

Statistical analysis

Collected data were tabulated in an Excel spreadsheet for Windows using SPSS software (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, version 19.0, Armonk, NY: IBM Corp. USA). Initially, data were assessed for nor-

mality using Levene's equality of variance test. Then, groups were compared using Student's *t* test, χ^2 test, and Fisher's exact test. The level of significance was 5%.

Results

The sample of this study included 102 adult individuals of both genders (51 patients with HIV/AIDS infection and 51 controls). Table 1 shows the socio-demographic characteristics of patients in the case and control groups, such as age, gender, skin color, marital status, and origin.

Most of the HIV-infected patients were males, White race, aged between 18 and 73 years (mean age, 41.1 ± 11.6 years), single, and living in the city of Curitiba (South region of Brazil). The pairing of the groups revealed that the profile of individuals in the control group was similar to the HIV group, except for skin color and marital status. The number of single or divorced patients was greater in the HIV-infected group, and there were more people with white skin in the control group (χ^2 test, $p < 0.05$).

Sixty-three percent of patients in the case group had an AIDS-defining illness. The reason for the patients' hospitalization was variable, but pneumocystis (39.2%) was the most frequent disease observed. Other diseases for hospitalization were pulmonary tuberculosis (9.8%), cytomegalovirus (CMV) infection (7.8%), gastrointestinal diseases (7.8%), syphilis (5.8%), herpes simplex virus (HSV) infection (5.8%), fungal infection (5.8%), herpes zoster (3.9%), toxoplasmosis (1.9%), cryptococcosis (1.9%), and severe anemia (1.9%). The median CD4 count was 311.4 ± 175 cells for patients with HIV/AIDS infection. Twenty-six (50.9%) patients in the case group had a CD4 count below 200 cells.

The mean salivary flow was significantly lower in HIV-infected patients when compared with controls (Student's *t*-test, $p = 0.04$). The maximum, minimum, and average values for salivary flow according to the groups are shown in Table 2. Twenty-five (49.0%) patients with HIV infection had low salivary flow (range, 0-0.69 ml/min), and only 19 (37.2%) individuals in the control group had salivary flow considered low.

The complaint of xerostomia was reported by 30 (59%) patients and 9 (18%) controls (Table 3). The xerostomia index revealed that most patients with HIV infection woke up at night to drink water (61%), drank fluids to help swallow (55%), and experienced dry skin (53%). Some of the controls also reported having the habit of getting up at night to drink water (25%), drinking fluids to help swallow (22%), and having difficulty eating dry food (18%). Table 4 demonstrates the intensity of xerostomia symptoms according to the groups. Chi-square and Fisher's exact tests revealed significant differences when comparing the intensity of xerostomia symptoms within the groups ($p < 0.05$). Six of the nine questions showed significant differences when HIV patients were compared with controls. The sensation of lack of moisture in the mouth was the only complaint, in which there was no record of severe intensity in either of the groups. The sensation of discomfort in the mouth, and difficulty to speak and eat had greater registers of moderate to severe intensity in the patients than in the controls.

Table 5 presents the oral health of the sample of the study. There was a significant increase in the prevalence of oral diseases in patients infected with HIV/AIDS compared with controls. The results revealed that the most frequent oral alterations in patients with HIV infection were missing teeth (69%), coated tongue (63%), caries (59%), and periodontal disease (45%). The most frequent oral changes in controls were caries (37%), coated tongue (31%), and periodontal disease (18%).

Table 6 demonstrates the profile of the sample in relation to the use of drugs and addictions. The results revealed that only 35 (68.6%) patients with HIV infection were taking antiretroviral drugs.

Seventy-six percent of patients were already using antiretroviral therapy, and the most used drugs were atazanavir, lamivudine, tenofovir, and ritonavir. Analysis of medications used by HIV-infected patients showed other drugs

Table 1. Socio-demographic characteristics of individuals with HIV infection and controls

Variables	Patients, *n* (%)	Controls, *n* (%)	*p*-value
Age (years)			
18-28	6 (11.7)	8 (15.7)	0.999
29-38	12 (23.5)	13 (25.5)	
39-48	21 (41.2)	18 (35.3)	
≥ 49	12 (23.5)	12 (23.5)	
Gender			
Male	29 (56.9)	29 (56.9)	1.000
Female	22 (43.1)	22 (43.1)	
Race			
White	29 (56.9)	44 (86.3)	0.001
Not White	22 (43.1)	7 (13.7)	
Marital status			
Single/divorced	28 (54.9)	18 (35.3)	< 0.001
Married	23 (45.1)	33 (64.7)	
Total	51 (100.0)	51 (100.0)	

χ^2 test ($p < 0.05$)

Table 2. Stimulated salivary flow in patients with HIV infection and controls

Variables	Patients ($n = 51$)	Controls ($n = 51$)	*p*-value
Salivary flow rate (ml/min)			
Mean ± SD	0.79 ± 0.44	1.03 ± 0.67	0.040*
Maximum	1.97	3.19	
Minimum	0.14	0.13	

**Student's t-test ($p < 0.05$)*

Table 3. Xerostomia index of 9 items for case and control groups

Questions	Case group Yes, *n* (%)	Case group No, *n* (%)	Control group Yes, *n* (%)	Control group No, *n* (%)	*p*-value
Do you feel dryness in your mouth?	30 (58.9)	21 (41.1)	9 (17.6)	42 (82.4)	< 0.001*
Do you have trouble eating dry food?	12 (23.5)	39 (76.5)	9 (17.6)	42 (82.4)	0.462
Do you get up at night to drink water?	31 (60.8)	20 (41.2)	13 (25.5)	38 (74.5)	< 0.001*
Do you feel dryness in your mouth during meals?	14 (27.5)	37 (72.5)	8 (15.7)	43 (84.3)	0.148
Do you drink fluids to help with food intake?	28 (54.9)	23 (45.1)	11 (21.6)	40 (78.4)	< 0.001*
Do you suck candy, or cough drops to relieve dryness in your mouth?	17 (33.3)	34 (66.7)	4 (7.8)	47 (92.2)	0.001*
Do you find it difficult to swallow certain foods?	13 (25.5)	38 (74.5)	1 (2.0)	50 (98.0)	< 0.001**
Do you feel skin dryness on your face?	27 (53.0)	24 (47.0)	4 (7.8)	47 (92.0)	< 0.001**
Do you feel dryness in your eyes?	11 (21.6)	40 (78.4)	4 (7.84)	47 (92.2)	0.091

*χ^2 test ($p < 0.05$). **Fisher's exact test ($p < 0.05$).*

Table 4. Intensity of xerostomia symptoms in patients with HIV infection and controls

Symptoms	Case group (*n* = 51)	Control group (*n* = 51)	*p*-value
Moisture			
Slight	8 (15.7)	1 (1.9)	0.031*
Moderate	21 (41.2)	29 (56.9)	
Severe	22 (43.1)	21 (41.2)	
Total	51 (100.0)	51 (100.0)	
Mouth discomfort			
Slight	24 (47.0)	28 (54.9)	0.092**
Moderate	11 (21.6)	16 (31.4)	
Severe	16 (31.4)	7 (13.7)	
Total	51 (100.0)	51 (100.0)	
Speech impairment			
Slight	29 (56.9)	39 (76.5)	0.077*
Moderate	13 (25.5)	9 (17.6)	
Severe	9 (17.6)	3 (5.9)	
Total	51 (100.0)	51 (100.0)	
Feeding impairment			
Slight	31 (60.8)	42 (82.4)	0.011*
Moderate	8 (15.7)	7 (13.7)	
Severe	12 (23.5)	2 (3.9)	
Total	51 (100.0)	51 (100.0)	

*Fisher's exact test ($p < 0.05$). **χ^2 test ($p < 0.05$).*

that could also induce xerostomia, such as anticonvulsants, anxiolytics, antidepressants, antiemetics, antipsychotics, antihypertensives, centrally acting analgesics, antidiarrheals, antidiabetics, vermicides, bronchodilators, antiallergics, and antimicrobials used in tuberculosis treatments.

Table 5. Oral health of patients with HIV infection and controls

Oral health	Case group (*n* = 51)	Control group (*n* = 51)	*p*-value
Lost teeth	35 (68.6%)	15 (29.4%)	< 0.001*
Coated tongue	32 (62.7%)	16 (31.3%)	0.001*
Dental caries	30 (58.8%)	19 (37.2%)	0.029*
Periodontal disease	23 (45.0%)	9 (17.6%)	< 0.001*
Residual root	15 (29.4%)	0 (0.0%)	< 0.001**
Oral candidiasis	12 (23.5%)	1 (1.9%)	0.018*
Melanotic maculae	10 (19.6%)	0 (0.0%)	< 0.001**
Dry mucosa	9 (17.6%)	4 (7.8%)	0.234
Atrophic glossitis	8 (15.6%)	0 (0.0%)	0.005**
Oral ulcer	7 (13.7%)	0 (0.0%)	0.005**

*Fisher's exact test ($p < 0.05$). **χ^2 test ($p < 0.05$).*

Anamnesis revealed that 59% of patients with HIV infection and 9.8% of controls were smokers. On the other hand, alcoholic individuals represented 15.7% in both the groups. In the case and control groups, 21.6% and 2% of individuals with a history of involvement with illicit drugs were identified, respectively (Table 6).

Discussion

HIV infection is an infectious disease caused by a virus that mainly compromises the human immune system. People with this advanced, untreated disease are more vulnerable to other illnesses (i.e., opportunistic infections and tumors) than those with a healthy immune system. Many patients develop oral candidiasis, periodontal diseases, physiological/racial pigmentations, and dry mouth with very low CD4+ lymphocyte count [19]. However, some patients may experience diffuse infiltrative lymphocytosis syndrome, and others only manifest hypo-salivation during the course of disease.

Table 6. Use of medications, smoking, and alcoholism in patients with HIV infection and controls

Medications and addictions	Patients (*n* = 51)	Controls (*n* = 51)
Antiretroviral therapy, *n* (%)	35 (68.6)	0 (0.0)
Protease inhibitors	2 (3.9)	0 (0.0)
Non-protease inhibitors	17 (33.3)	0 (0.0)
Protease inhibitors + non-protease inhibitors	16 (31.4)	0 (0.0)
No use of antiretroviral drugs	16 (31.4)	0 (0.0)
Medications, *n* (%)		
Anticonvulsants*	4 (7.8)	0 (0.0)
Anxiolytics*	12 (23.5)	0 (0.0)
Antipsychotics*	4 (7.8)	0 (0.0)
Antidepressants*	9 (17.6)	0 (0.0)
Antihypertensive drugs*	3 (5.9)	0 (0.0)
Vitamins and minerals	24 (47.0)	0 (0.0)
Analgesics	29 (56.8)	0 (0.0)
Centrally acting analgesics*	4 (7.8)	0 (0.0)
Antiemetics	27 (52.9)	0 (0.0)
Antiulcer	22 (43.1)	0 (0.0)
Tuberculosis treatment (rifampicin + isoniazid + pyrazinamide)*	4 (7.8)	0 (0.0)
Antivirals	17 (33.3)	0 (0.0)
Antibiotics	40 (78.4)	0 (0.0)
Antifungals	20 (39.2)	0 (0.0)
Antidiarrheals*	1 (1.9)	0 (0.0)
Anticoagulants	2 (3.9)	0 (0.0)
Antimalarials	6 (11.7)	0 (0.0)
Intestinal flora replenishers	3 (5.8)	0 (0.0)
Expectorant syrups	3 (5.8)	0 (0.0)
Anti-inflammatories	2 (3.9)	0 (0.0)
Corticosteroids	7 (13.7)	0 (0.0)
Vermicides*	3 (5.8)	0 (0.0)
Antidiabetics*	2 (3.9)	0 (0.0)
Hormones for thyroid	4 (7.8)	0 (0.0)
Diuretics	1 (1.9)	0 (0.0)
Muscle relaxants	1 (1.9)	0 (0.0)
Antiflactulence	1 (1.9)	0 (0.0)
Laxative regulators	2 (3.9)	0 (0.0)
Antiallergics*	2 (3.9)	0 (0.0)
Bronchodilators*	1 (1.9)	0 (0.0)
Addictions, *n* (%)		
Smoking	30 (58.8)	5 (9.8)
Alcoholism	8 (15.6)	8 (15.6)

**Drugs inducing hypo-salivation.*

The present study investigated the prevalence of xerostomia and factors associated with the presence of hypo-salivation in a group of 51 patients hospitalized due to complications of HIV/AIDS infection. The results revealed that the prevalence of xerostomia was much higher than that observed in the literature. To date, different studies have been carried out among children and adults with HIV infection, and reported a prevalence of xerostomia ranging from 4.4% to 37.5% [10, 11, 19-21]. However, this higher prevalence of xerostomia may have been influenced by the fact that sample collection was performed during the hospitalization period. In addition, the treatment of patients with complications associated with AIDS involves the use of various medications simultaneously during hospitalization.

As mentioned above, complications associated with AIDS are responsible for several opportunistic diseases and neoplasms. Pneumonia is one of these complications, and has been identified as the major cause of morbidity and mortality in individuals living with HIV [22]. Pneumocystosis, an opportunistic infection caused by Pneumocystis jirovecii, was the most common complication associated with HIV infection in the patients in this study (39.2%). The appearance of these diseases associated with AIDS can almost always lead to the need for hospitalization of the patient. The average number of hospitalizations for patients with complications associated with HIV infection is decreasing with the advent of antiretroviral therapy [23]. However, when a patient with complications associated with AIDS is hospitalized, the hospital stay and treatment last for 11 days [24]. During hospitalization, there are several clinical procedures applied, with different drugs and several complementary exams. Therefore, it is natural for the patient to become anxious and stressed out, as the period of hospitalization can affect the patient's general and oral health. The hypo-function of the salivary glands, which results in a low salivary flow, has been observed among HIV-infected patients compared with HIV-free individuals [25, 26]. Changes in salivary flow may be associated with the progression of HIV disease or immune status of patients [26].

Salivary flow is an important parameter, as it reflects the functioning of the salivary glands. Under healthy conditions, adult individuals produce 500 to 1,500 ml of saliva per day, or between 0 and 6 ml per minute [27]. The average salivary flow in individuals with HIV infection was 0.7 ml/minute, and considered low when compared with controls. These findings are in line with the results of Lin *et al.* [28] and Liberali *et al.* [29], who also observed a significant reduction in the salivary flow of individuals with HIV. In addition to the disease caused by HIV, other factors may have also contributed to reducing the salivary flow in our sample. One of these factors was smoking, as 59% of the sample were smokers, and 49% had hypo-salivation. These findings corroborate the results of Dyasanoor and Saddu [30], who demonstrated that 43% of smokers develop hypo-salivation. Long-term smoking significantly reduces salivary flow,

and increases oral and dental disorders associated with dry mouth, especially cervical caries, gingivitis, tooth mobility, calculus, and halitosis [31].

Various medications can also influence the oral moisture and salivary flow rate [32-34]. Hospitalized patients used antiretroviral drugs and other medications, which can induce hypo-salivation and, consequently, xerostomia, such as anticonvulsants, anxiolytics, antidepressants, antiemetics, antipsychotics, antihypertensives, centrally acting analgesics, antidiarrheals, antidiabetics, vermicides, bronchodilators, antiallergics, and antimicrobials used in tuberculosis treatments. Antiretroviral therapy, especially protease inhibitors, can interfere with the functioning of the salivary glands and cause hypo-salivation. According to Navazesh *et al*. [13], the highly active antiretroviral therapy based on protease inhibitors represents a significant risk factor for the development of a reduced unstimulated and stimulated salivary flow as well as the enlargement of the salivary glands. It is important to note that 74% of individuals with HIV infection used antiretroviral therapy, and the following protease inhibitors were used: ritonavir (30%), atazanavir (22%), lopinavir (13%), fosamprenavir (2%), and tipranavir (2%). A reduction in the salivary flow has been reported in individuals undergoing long-term antiretroviral therapy [12].

In addition to antiretroviral drugs, some patients included in the current study used other drugs capable of inducing hypo-salivation, such as antidepressants and anxiolytics. The neuronal regulation of salivation is controlled by the sympathetic and para-sympathetic autonomic nervous system. Therefore, all drugs that interfere with the central and peripheral nervous systems, regardless of their purpose, will have an influence on the production of saliva. Some drugs can interfere with nerve stimulation, while others can destroy or alter the functions of glandular acini or ducts. These effects can be sialorrhea or hypo-salivation, both sources of patients' discomfort [27].

The evaluation of xerostomia in relation to the humidity of the mouth, difficulty in speaking, difficulty in eating, and oral discomfort revealed that the intensity of these complaints was higher among patients with HIV infection than controls, which is in line with the findings of López-Verdín *et al*. [10].

Of all these xerostomia symptoms, most hospitalized patients rated the sensation of mouth discomfort as being moderate to severe. In this context, dental surgeons should use all available therapeutic resources to relieve oral discomfort in these patients. In addition, treatment should prevent complications whenever possible. Strict oral hygiene with the use of fluoridated toothpastes to reduce the risk of caries, careful cleaning of mobile dentures, and balanced and non-cariogenic diet should all be advocated. Moreover, sodium bicarbonate mouthwashes should be preferred over commercially available antiseptic solutions, usually based on alcohol. They end up being more irritating and increase the feeling of dry mouth. Excessive consumption of tobacco, alcohol, coffee, and tea should be avoided, as it increases dryness of the mouth. In addition, some spicy or acidic foods are aggressive and irritating on dry and thin mucous membranes [35].

According to data from the World Health Organization, over two-thirds of all people living with HIV reside in Africa (25.7 million) [36]. Therefore, it is expected that many HIV-positive individuals will be hospitalized to treat the complications of this disease and experience dry mouth. Pedrazas [37] reported on the management of a patient with hypo-salivation, and showed that systemic changes and the use of medications may lead to hypo-salivation. In turn, the reduction in the salivary flow causes discomfort and increases susceptibility to infection. To reduce these effects caused by hypo-salivation, the author proposed the use of salivary substitutes and techniques for increasing salivary flow, the indication of which will depend on an etiological factor and severity of hypo-salivation. Milking the salivary gland and sialometry are the simplest ways to assess hypo-salivation. A physiological salivary stimulant can be effective, such as consumption of ascorbic, malic, and citric acids in the form of a tablet or solution, for patients where the prognosis is favorable, and the salivary parenchyma has not suffered serious destruction. In cases with severe or total loss of glandular tissue, artificial saliva can be applied, as it improves oral function as a whole. However, this artificial saliva has few active substances, and remains in the mouth for a short time.

Conclusions

The prevalence of xerostomia was high in patients hospitalized due to complications of HIV infection. Such patients usually have a low salivary flow that promotes a feeling of oral discomfort. However, side effects of drugs used to treat HIV-positive patients cannot be excluded.

Disclosure

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