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Official Publication of Indonesian Oral Medicine Society | Ikatan Spesialis Penyakit Mulut Indonesia (ISPMI)

- A Comprehensive Approach to Geriatric Patient Care Based on Geriatric Assessment. A Case Report
- Oral Aphthous-like Ulcers Response to Topical Therapy in Young Adult Woman with Beta-Thalassemia Intermedia. Case Series
- Common Oral Manifestations in a Denture Wearer Patients with Suspected Diabetes Mellitus. A Case Report

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EDITORIAL TEAM

"We are like dwarfs sitting on the shoulders of giants. We see more, and things that are more distant, than they did, not because our sight is superior or because we are taller than they, but because they raise us up, and by their great stature add to ours." John of Salisbury

ABOUT JIOMS

The Journal of Indonesian Oral Medicine Society (JIOMS) is a peer-reviewed scientific journal published thrice a year by the Indonesian Dental Board Association (Persatuan Dokter Gigi Indonesia) through its Indonesian Oral Medicine Association (Ikatan Specialist Penyakit Mulut Indonesia or ISPMI).

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CASE REPORT

A Comprehensive Approach to Geriatric Patient Care Based on Geriatric Assessment

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ABSTRACT

Background Care for geriatric patients must consider several factors. It is critical to thoroughly examine elderly patients to develop an ideal treatment plan for patients using a series of geriatric assessments. **Case report** The first patient was a 63-year-old male complaining of an open wound on several loose upper left teeth. It is suspected that he had undiagnosed diabetes mellitus. The second patient was a 70-year-old female having difficulty eating due to a loose upper left tooth with generalized enlarged gingiva. The patient had hypertension and was taking the medication without any supervision. A geriatric assessment was performed, which included the GOHAI (Geriatric Oral Health Assessment Index) examination, the Barthel Index of Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Mini Nutritional Assessment (MNA), and Mini-Cognitive. The two patients consulted with the internist before receiving further treatment. **Conclusion** A comprehensive examination with Geriatric Assessment can help dentists determine the best treatment plan for geriatric patients.

Keywords: geriatric, geriatric assessment, comprehensive care, GOHAI

INTRODUCTION

Ageing is a natural process when a person experiences a gradual physical, mental, and social decline and can no longer carry out daily tasks.[1,2] Geriatric patients are people aged sixty years and over with multiple diseases with or without disorders who require integrated health services with a multidisciplinary approach that works interdisciplinarily.[3] Situations prevalent in older individuals, especially frail ones, are termed geriatric syndromes to demonstrate that the combined manifestations can be attributed to various factors.[4]

Diseases in the oral cavity in geriatric patients can harm their overall health and quality of life. Several conditions often occur in the oral cavity of geriatric patients, such as tooth loss, dry mouth, and periodontitis.[2] Operators must be able to reveal the underlying problem because it is often related to a wider range of conditions, for example, systemic conditions, polypharmacy, or their inability to express their problems due to the geriatric syndromes so they can have a good quality of life. Currently, publications regarding the use of geriatric assessment in dental and oral care have yet to be found.

This article reports two geriatric cases with features of geriatric syndrome that need to be carefully assessed so operators can provide optimum patient care while prioritizing the patient's quality of life and paying attention to the patient's systemic health. The geriatric assessment performed included the GOHAI (Geriatric Oral Health Assessment Index), the Barthel Index of Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Mini Nutritional Assessment (MNA), and Mini-Cognitive. Both patients have consented to have their cases published.

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CASE REPORT

Case 1

A 63-year-old male came to Universitas Gadjah Mada Prof. Soedomo Dental Hospital complaining of an open wound on the upper left gum, and the teeth had been loose since a month ago. He had no pain, swelling, or discharge from the area. About twelve years ago, his blood sugar level was checked at a pharmacy, which turned out to be higher than normal. He never had further examination or taken medication for this condition. A month ago, the patient's random blood glucose was 190mg/dL, and recently, the patient claimed to have lost weight. On arrival, the patient's blood pressure was 145/69 mmHg. The patient had cataract surgery in the right eye, but it still felt blurry and dry.

On intraoral examination, there was a single round ulceration, regular edges with clear borders with a diameter of 6 mm and covered by yellowish-white pseudomembrane appeared on the alveolar mucosa of the apex of tooth 26, exposing the root structure of the tooth. There was also buccal-palatal >1 mm mobility of the teeth with an accumulation of supragingival and subgingival calculus (Figure 1). A panoramic radiograph examination showed a generalized alveolar bone loss in a horizontal direction of about 2 – 5 mm with a well-defined radiolucent area of irregular shape at the apex of tooth 26, extended laterally to reach the alveolar crest involving the bifurcation area (Figure 2). A diagnosis of general chronic periodontitis with apical fenestration of tooth 26 was established.

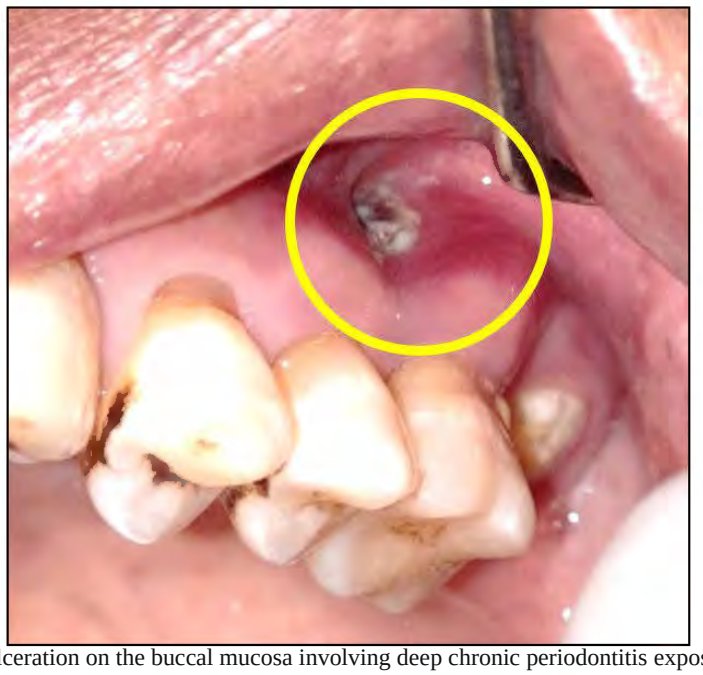

Figure 1. Single round ulceration on the buccal mucosa involving deep chronic periodontitis exposing the root structure of the tooth 26

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Figure 2. Panoramic radiograph showed a generalized bone loss and radiolucent area at the apex of tooth 6 (yellow marking)

The geriatric assessment was carried out with high GOHAI results; the patient could perform activities independently based on ADL and IADL indexes; the patient was at risk of malnutrition based on MNA; and negative dementia screening based on Mini-Cognitive test. From the GOHAI index, it was found that the patient had no problems chewing nor limiting the consumption of certain foods; he only experienced pain when exposed to hot, cold, or sweet. The patient was instructed to gargle with warm salt water and referred to an internist regarding the possibility of systemic disease to avoid complications before scaling, root planning, and tooth extraction 26.

The internist responded that the patient was diagnosed with stage I Hypertension and Diabetes Mellitus and was prescribed 5 mg amlodipine once daily and 5 mg metformin twice daily. Dental treatment could be performed if the blood pressure was less than or equal to 140/80 mmHg and the random blood sugar was less than 200 mg /dL. Until the last contact, the patient took the medication regularly but was still scheduled for the planned dental treatment.

Case 2

A 70-year-old female came to Universitas Gadjah Mada Prof. Soedomo Dental Hospital complaining that her upper left back tooth was loose. The tooth had interfered with her eating since three years ago. The condition was exacerbated when she was using a denture made by an unauthorized denture maker that attached the denture to the adjacent teeth, eventually damaging bit by bit, causing the tooth to loosen more severely. The patient admitted she was worried about making dentures again, and her gums seemed enlarged. The patient has had hypertension (blood pressure was 163/89 mmHg on arrival) for five years and regularly consumes Amlodipine 10 mg once daily on the recommendation of her relatives. The patient also complained of knee pain and took Methylprednisolone and Potassium diclofenac from a general practitioner.

On intraoral examination, there was a third-degree luxation in the buccal-palatal and vertical direction on tooth 25, multiple radices, abscess at the apex of radix 13, moderate Oral Hygiene Index (OHI), and general gingival enlargement on the upper and lower jaws. Palpation of the enlarged gingiva was firm with the same colour as the surrounding tissue, and it caused

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the shifting of several teeth (Figure 3). A panoramic radiograph examination showed a radiolucent area with a diameter of 3 mm with clear boundaries at the apex of tooth 13 and a radiolucency with a diameter of 6 mm at the apex of tooth 25, as well as generalized alveolar bone loss (Figure 4).

Figure 3. Luxation on tooth 25 and general gingival enlargement due to inflammation

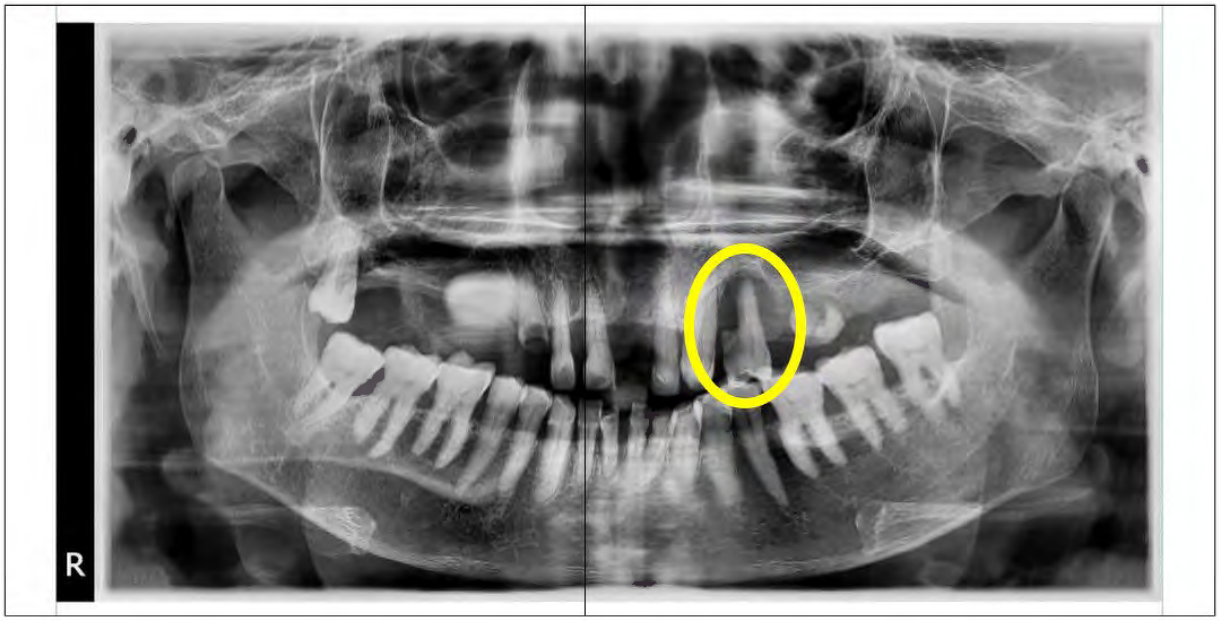

Figure 4. Panoramic radiograph showing radiolucent area at the apex of tooth 25, the yellow marking

A geriatric assessment was conducted with moderate GOHAI index results, mild dependence on ADL and IADL indexes, normal nutrition on MNA, and negative dementia screening on the Mini-cognitive test. From the results of the GOHAI index, it was found that the patient was not happy with the condition of her teeth now and had concerns about them. The patient had mild dependence that she needed help climbing stairs; she could not use the telephone and needed help washing her daily clothes. The patient was referred to an internist regarding her hypertension and the proper medication before scaling and root planning, extraction of the troublesome teeth, and making dentures. A gingivectomy was tentative regarding the gingival enlargement. Given the mild dependence on the patient, the following

dental and oral care for the patient was performed with operator assistance. The internist responded that the patient had stage II Hypertension and genu osteoarthritis. The internist prescribed Amlodipine 10 mg in the morning, Candesartan 8 mg in the evening, and Meloxicam 7.5 mg twice daily. Dental treatment could be performed only if the blood pressure is less than 140/80 mmHg. The patient was still on observation since the blood pressure was unstable.

DISCUSSION

Elderly people with geriatric syndromes have complexities that necessitate careful and detailed consideration. There are fourteen geriatric syndromes, often referred to as the 14 "I"s: immobility, instability, incontinence, intellectual impairment, infection, impairment of vision and hearing, irritable colon, isolation, inanition, impecunity, iatrogenesis, insomnia, immune deficiency, impotence.[3,5]

Several signs of geriatric syndromes are similar in these two cases, consisting of infection, immune deficiency, impecunity, and risk of iatrogenesis. The signs of infection and immune deficiency in the first patient were general chronic periodontitis accompanied by apical fenestration on tooth 26, exacerbated by diabetes mellitus, which had not been treated for years. In the second patient, loss of many teeth and periapical pathosis were found. The sign of impecunity in the first patient was that he worked as a construction worker without health insurance, thus delaying medical check-ups. The second patient had a busy schedule of receiving orders for traditional snacks, which made it difficult to do a routine check-up. Iatrogenesis is one of the problems that arise from taking many medications. In the first patient, educating him about possible side effects from the medication that will be consumed routinely is necessary. In the second patient, consuming Amlodipine without supervision and moderate OHI influenced the appearance of gingival enlargement. The drug buildup in the gingival crevicular fluid in the presence of bacteria might lead to the activation of proinflammatory cytokines, resulting in gingival enlargement after long-term use (at least three months).[6,7]

A geriatric assessment can examine in more detail the problems geriatric patients suffer. The geriatric assessment consisted of the GOHAI, ADL, IADL, MNA, and Mini-Cognitive instruments. The GOHAI instrument is available in Indonesia and has been used to assess oral health-related quality of life.[8] GOHAI instrument was used to assess the quality of life of elderly patients related to the condition of their teeth and mouth to assess physical function dimensions, psychosocial functioning, pain or discomfort, and a feeling of discomfort in the teeth and mouth area.[9] The higher the result, the better the patient's oral health condition. The dentist can also examine the question points in the instrument. The first patient showed a high GOHAI index. However, the patient admitted to feeling tooth pain due to hot, cold, or sweet foods or drinks. The second patient showed a moderate GOHAI index. Thus, the operator had to examine further what conditions on the questions could be the sources of the dental problems.

ADL, IADL, MNA, and Mini-Cognitive instruments used were also available in the Indonesian version developed by The Ministry of Health (2017). The Barthel Index measures the basic Activities of Daily Living (ADL) functions, like dressing, bathing, and grooming self-care skills.[11] Geriatric patients should do the basic ADL independently to live well.[12] Instrument activities of daily living (IADL) are activity indicators that enable individuals to live independently in a community. If there are many limitations to performing ADLs and IADLs, it indicates the need for home healthcare or placing the patient in an integrated care facility.[13] In the first case, the patient was highly capable and independent, while in the second case, the patient had mild dependence on climbing stairs and using the telephone. For the second patient, the operator can place the patient on the first-floor facility, use the elevator, follow up a visit by calling the patient instead of sending messages, or even visit the patient's house.

MNA is an instrument used to evaluate the geriatric patient's risk of malnutrition to facilitate nutritional interventions as early as possible.[14] MNA instrument requires more time to complete, but it provides more comprehensive evaluations and measures, making it simpler to determine geriatric patients' nutritional status.[15] In the first case, the patient was at risk of malnutrition because he had decreased food intake and lost weight 1 to 3 kg in the last three months. This finding correlated with the GOHAI index result that the patient had pain when eating hot, cold, and sweet foods, decreasing his appetite. While the second patient's nutritional status was normal, the operator could check the patient's daily dietary pattern to optimize the nutritional status.

The Mini-Cognitive is an effective neuropsychological test for detecting dementia patients.[16] If dementia is detected in geriatric patients, operators can anticipate it by educating caregivers, bringing notes, and simplifying medication and care. In these two cases, both patients had a negative screening for dementia.

CONCLUSION

Dental and oral care for geriatric patients has complexities caused by multifactorial health conditions prevalent in older adults called Geriatric Syndromes. Hence, a comprehensive approach must be applied, such as using a Geriatric Assessment that includes GOHAI, ADL, IADL, MNA, and Mini-Cognitive examinations to analyze the sources of the complaints and develop effective treatment for the patients. Although delayed dental treatments had been anticipated in these two patients, comprehensive treatment planning had been addressed by dental caregivers.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this case report.

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CASE REPORT

Oral Aphthous-like Ulcers Response to Topical Therapy in Young Adult Woman with Beta-Thalassemia Intermedia

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ABSTRACT

Background: Beta thalassemia may have some oral manifestations. Oral mucosa ulcer may be one of the oral manifestations of beta-thalassemia. The oral ulcer may resemble recurrent aphthous stomatitis (RAS). This current case report aims to present an aphthous oral ulcer as a manifestation in young adult women with beta-thalassemia**. Case report:** A 28-year-old woman complained of recurrent painful oral ulcers in the labial mucosa. She was diagnosed with beta-thalassemia intermedia three years before. The ulcer may take 3-4 weeks to heal completely. Intraoral examination revealed two yellowish ulcers, 5 mm and 10 mm, surrounded by an erythematous halo, regular margin on left lips mucosa, oral ulcer pain scale measured medium level by visual analogue scale (VAS). The oral aphthous-like ulcer was taken for diagnosis in this case. Topical treatment was given to the oral ulcer using chlorine dioxide gel three times daily. After 10 days, the oral aphthous-like ulcer was healed. **Conclusion:** An oral aphthous-like ulcer may be the oral manifestation in beta-thalassemia patients, and the oral ulcer may respond well to topical treatment commonly used in recurrent aphthous stomatitis (RAS) patients. Hence, it is important to recognize oral conditions as one clinical manifestation in beta-thalassemia patients and choose the appropriate treatment to accelerate oral ulcer healing.

Keywords: Beta-Thalassemia, oral manifestation, oral ulcer, topical therapy

INTRODUCTION

Thalassemias are a group of inherited autosomal recessive hematologic disorders characterized by defects in one or more of the haemoglobin chain syntheses. Alpha thalassemia is caused by reduced or absent alpha globin chain synthesis, whereas beta-thalassemia is caused by reduced or absent beta globin chains. Approximately 1.5-1.7% of people in the world have both types of thalassemias. Both types of thalassemia are prevalent in African and Southeast Asian descent. However, beta thalassemia may also occur in the Mediterranean, Middle East, Central Asia, India, southern China, and South America. Both types of thalassemia may cause an imbalance of globin chains and cause hemolysis resulting in impaired erythropoiesis.[1] Beta-thalassemia is a syndrome group classified into thalassemia major of Cooley's Anemia, Thalassemia Intermedia (Mediterranean Anemia), and Thalassemia minor.[1] Other types of Beta thalassemia are Beta thalassemia with associated Hb anomalies (HbC, HbE, HbS), Hereditary persistence of Fetal Hb, and Beta-thalassemia, Autosomal dominant forms, beta thalassemia associated with other manifestations.[1] Beta-thalassemia minor may only have microcytosis and

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mild anemia without any signs and symptoms, whereas Beta thalassemia major may have many signs and symptoms such as abdominal swelling, growth retardation, irritability, jaundice, pallor, skeletal abnormalities, splenomegaly, and requires lifelong blood transfusions. Beta-thalassemia intermedia may have variable severity signs and symptoms and be less severe than Beta-Thalassemia major.[1]

Epidemiology studies showed that thalassemia has oral manifestations. A study showed that children and adolescents with thalassemia have low growth rates with an increase in age and significant delays in dental development.[2] The most common orofacial manifestations of beta-thalassemia are prominent frontal and parietal bones, sunken nose bridge, protruding zygomas and mongoloid slanting eyes, enlargement of maxilla and obliteration of maxilla sinus, depression of nose bridge that results in facial appearance chipmunk face.[3,4] Furthermore, most Beta-thalassemia patients are children and young adults. Beta thalassemia may have oral manifestations such as lip incompetence, maxillary protrusion, and gingivitis.[5] Some oral conditions or disorders are also associated with thalassemia, such as pale oral mucosa, halitosis, oral ulcer, oral mucosa pigmentation, cheilitis (angular cheilitis, actinic cheilitis), hypo mineralization, fungal infection (candidiasis), burning sensation, geographic tongue, fissured tongue and poor oral hygiene.[6,7] Beta-thalassemia patients also have a poor oral health-related quality of life compared with healthy children.[8,9]

There are also some case reports of Beta-thalassemia with various oral manifestations. Most case reports were Beta-thalassemia with dentofacial manifestation management, such as a case report of a young boy with Beta-thalassemia with dental and swelling in the upper teeth region,[10] a case report of a young boy diagnosed with beta-thalassemia had skeletal class II tendency and protrusive appearance of maxillary growth.[11] Another case report of Beta-thalassemia was in young adult women with dental pain management in conjunction with Beta-thalassemia treatment.[12] Oral mucosa ulcer may also be an oral manifestation of Beta-thalassemia. There were few cases of oral ulcers in beta-thalassemia, although there was a case report of aphthous-like ulcers in beta-thalassemia intermedia patients.[13] Here, we also would like to present the aphthous-like ulcers in young adult women with beta-thalassemia intermedia and responded well to topical therapy. Beta-thalassemia intermedia is a systemic disease; topical therapy may still be challenged for oral ulcer treatment since the β thalassemia intermedia may compromise oral ulcer healing due to anaemia. Hence, topical non-drug use with combination actions not only anti-inflammatory but also antiseptic, and another component such as aloe extract that accelerates wound healing may be useful.

CASE REPORT

A 28-year-old woman came to UGM Dental Hospital complaining of painful ulcers on her lower lip. She had felt the ulcers for 5 days. The ulcers appeared after her lips were unintentionally bitten. The ulcer's size was getting larger, and she felt the ulcers were more painful, especially when eating. She has had oral ulcers and recurrent history for more than 6 years. Typically, her ulcers need approximately 3-4 weeks to heal without any treatment. She had a scaling treatment 3 years ago, tooth filling 4 years ago, and wisdom teeth extraction 5 years ago with prolonged bleeding for 3 days. She also had orthodontic treatment for 5 years. She routinely brushes her teeth twice daily. For medical history, she was diagnosed with thalassemia at 3 years old, and she had been explicitly known as a Beta-Thalassemia intermedia patient in the past 3 years and required occasional blood transfusions for this condition. She does not have any allergy history. Her father and mother have hypertension. She is not married and lives with her parents. She does not smoke or drink alcohol.

In physical examination, she had a normal BMI (19.5), the vital signs were normal, and the pain severity of her ulcers was 5 when measured using a visual analogue scale (VAS). No

abnormalities were found in the extraoral examination. Intra-oral examination revealed two yellowish ulcers, 5 and 10 mm each; both were surrounded by an erythematous halo, the regular margin on the left lip's mucosa. Other lesions were physiological pigmentation, torus palatines, coated tongue, and gingivitis in some regions. A complete blood examination results from one month previously showed erythrocytes ($3.46x10^6$ µL), Hb (7.8 g/dL), haematocrits (24.3%), MCV (70.2 Fl), MCH (22.5 Pg), thrombocyte ($132x10^3$ µL) all were low, and the other parameters were normal. The oral aphthous-like ulcer diagnosis was concluded. The ulcers were treated topically with chlorine dioxide gel three times daily. The ulcer regressed after 4 days of treatment (Figure 2) and healed after 10 days of treatment (Figure 3).

Figure 1. Yellowish ulcers on the left lower labial mucosal area are around 5 mm in double-round shape, with a well-demarcated margin, and the erythematous surrounding area (1st visit).

Figure 2. The left lower labial mucosal ulcer was reduced in size after being treated for 4 days using topically chlorine dioxide gel (2nd visit).

Figure 3. The ulcers showed a progressive healing process after 10 days of treatment using a topical application of chlorine dioxide gel on the site. The young epithelial tissue showed a pink colour (3rd visit)

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DISCUSSION

Oral mucosa ulcer is among the most common oral manifestations of beta-thalassemia.[6,7] The type of oral ulcer may resemble recurrent aphthous stomatitis (RAS) with the clinical characteristic of one or more well-demarcated, round oral ulcers, yellowish based, surrounded by an erythematous area, located in non-keratinized mucosa, with 1-10 mm size.[14] The patient also had experienced recurrent oral ulcers after being diagnosed with Beta-thalassemia, which healed by itself within 3 weeks duration without accompanied or preceded symptoms and followed by any lesion on other parts of the body. This patient was diagnosed with beta-thalassemia intermedia in the last three years. This is quite common due to the nature of beta-thalassemia as non-transfusional dependent thalassemia (NTDT), so a patient might be diagnosed later in life.[1]

This case is similar to the previous case report about aphthous-like ulcers in a man with Beta-thalassemia, which is also induced by trauma,[13] However, in this case report, our patient is a female, and the ulcer may also be related to the decreased in her physical condition. The explanation of both factors may contribute to oral ulcers based on the patient's history. The oral ulcer will recur when the patient feels unwell physically and has trauma on-site. Trauma is the most precipitating factor of oral ulcers and may be the precipitating factor for RAS.[14] Physical stress has been known as one of the precipitating factors of aphthous ulcers.[15,16] Like psychological stress, the decreased physical condition may cause stress conditions that disrupt the immunity balance.[17] The immunity imbalance (Th1/Th2) may dysregulate the immune response, altering the immune response to unknown antigens in oral mucosa and resulting in oral ulcers.[18]

The aphthous-like ulcer in beta-thalassemia may also be predisposed by an anaemia condition in thalassemia patients. The reduced Beta globin chains may lead to erythroid precursors in bone marrow, resulting in ineffective erythropoiesis. Haemolysis contributes to anaemia. The patient received a blood transfusion to correct the anaemia condition.[1] Prolonged anaemia may compromise oral mucosal turnover, make it vulnerable to any stimuli that precipitate oral ulcer development, and delay oral mucosal ulcer healing.[19]

Considering the thalassemia condition was not severe, the aphthous oral ulcer, in this case, was treated using a common topical drug such as topical chlorine dioxide gel.[13] The main goal of oral ulcer treatment is to reduce pain and inflammation, lessen the duration of oral ulcers, and prevent local trauma and secondary infections.[20] The topical gel containing Chlorine dioxide (ClO_2) may help to accelerate oral ulcer healing by the antibacterial, antifungal, and fungicidal action without any serious adverse effects.[21-23] The zinc and aloe vera components may have antioxidant activity and increase re-epithelization and immunomodulation.[24,25] Hence, it may facilitate faster healing of oral ulcers. It was shown that the aphthous-like ulcer in this patient was healed approximately only in 10 days. The important thing was that the patient admitted that the oral ulcer may be influenced by her systemic condition and that topical medication may help accelerate the healing of the oral ulcer. Although the oral ulcer may be one of the oral manifestations of Beta-thalassemia intermedia. This current case had a similar precipitating factor to recurrent aphthous stomatitis (RAS). Since the onset of oral ulcer of this case in adult age after she was diagnosed with Beta-thalassemia intermedia and recurrent. Further examination, such as histopathology and other factors, such as nutrition, is needed since the systemic condition may compromise nutrition status, which may be the limitation of this case report.

CONCLUSION

The oral ulcer in a patient with beta-thalassemia intermedia may resemble the clinical features of more common ulcerations, such as aphthous stomatitis. A thorough anamnesis and history taking are important to disclose the main factors contributing to a patient's condition. Topical Chlorine dioxide (ClO_2) may accelerate the healing of the ulcer in such a case.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this case report.

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CASE REPORT

Common Oral Manifestations in a Denture Wearer Patients with Suspected Diabetes Mellitus

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ABSTRACT

Background. Acute pseudomembranous candidiasis, often called oral thrush, is a disease in the oral cavity caused by the overgrowth of *Candida albicans*. Angular cheilitis is an inflammatory lesion on the corners of the mouth. The purpose of this case report is to document the oral manifestations in patients with suspected diabetes mellitus. **Case Report**. A 57-year-old woman complained of a burning sensation throughout the mouth and lips, presenting a white spot on her tongue with soreness in the past year. The patient self-reported to have diabetes mellitus and regularly takes medication. Despite this, the patient still has experienced classical signs of diabetes mellitus, which are polyphagia, polydipsia, and polyuria. Intraorally, the burning sensations were related to the full denture continuous wear, and she was diagnosed with acute pseudomembranous candidiasis and angular cheilitis. The treatment given to this patient was symptomatic therapy in the form of Aloclair Plus mouthwash, causative therapy in the form of Nystatin oral suspension and referral to an internist to further examine the condition of diabetes mellitus, and supportive therapy in the form of lanolin and vaseline.

Keywords: oral manifestation, diabetes mellitus, candidiasis, angular cheilitis, oral complications

INTRODUCTION

The duration of hyperglycaemia influences the oral manifestation and complications of diabetic conditions. In chronic hyperglycaemia, a patient develops complications such as xerostomia (dry mouth), caries, gingivitis, periodontal diseases, burning mouth (glossodynia, dysgeusia), coated and fissured tongue, candidiasis, and defective wound healing. Therefore, blood glucose control is very important to prevent further impairment.

One of the most common complications of denture wearers with a diabetes mellitus background is denture stomatitis or candidiasis. Oral candidiasis is caused by the overgrowth of *Candida albicans* in suitable environments, such as in diabetic oral conditions where salivary flow is decreased, poor metabolic control is present, and defence mechanisms are impaired. *Candida spp*., as a commensal microorganism comprising 53% of microbes in the oral cavity, will turn into a pathogen when the oral condition favours it.[1] In the xerostomic mouth, one of the suitable conditions where salivary gland dysfunction occurs, candida-related lesions may flourish. Clinically, it may present as denture stomatitis, angular cheilitis, median rhomboid glossitis, and whitish-speckled lesions such as pseudomembranous candidiasis. Acute pseudomembranous candidiasis, often called oral thrush, is often seen in elderly, immunocompromised conditions such as AIDS, diabetes mellitus, the prolonged use of corticosteroids, and those with haematological disorders. The lesions appear as white to whitish-yellow plaques that can be removed by scraping, leaving erythematous and sometimes bleeding surfaces. The areas of the oral cavity that are often affected include labial mucosa, buccal mucosa, tongue, hard palate, soft palate, and oropharynx.[2,3]

Angular cheilitis is an inflammatory lesion in the corners of the mouth. Clinically, it is characterized as erythema, ulceration, or crusting area in the corner of the mouth, either unilaterally or bilaterally. This lesion can cause pain, tenderness or even a burning sensation. The prevalence in adults reaches 0.7—3.8% equally in both males and females and often occurs in the third to sixth decades. The causes of angular cheilitis are multifactorial, including anatomical factors, allergies, microorganisms, nutritional deficiencies, and systemic conditions such as xerostomia and diabetes mellitus.[4]

To establish the diagnosis of diabetes mellitus, patients can be examined based on anamnesis regarding classic symptoms and objectively on screening tests. The classic symptoms are an increase

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in hunger (polyphagia), thirst (polydipsia), and urination (polyuria). A test to establish the diagnosis of diabetes mellitus is the glucose screening test. A glucose level greater than 200 mg/dl may indicate a patient with diabetes mellitus.[5]

In this case, several oral manifestations were found in a diabetes mellitus patient. This case report aims to discuss different oral manifestations of the conditions, starting from understanding the clinical manifestation, aetiology, predisposing factors, diagnosis, and appropriate treatments. Different oral manifestations may provide adequate information for further referral and treatment to other healthcare workers.

CASE REPORT

A 57-year-old female patient came with complaints of a burning sensation in the entire mouth and lips that started a year ago. The patient reported that the burning complaint appeared spontaneously and experienced pain throughout the day. She had already been treated with traditional Chinese herbal remedies and had been prescribed antifungal drops of Nystatin by a general practitioner without much success. No history of fever was reported regarding the present complaint.

The patient reported that she had amlodipine for her hypertension and had it changed to Adalat Oros (nifedipine) six months ago. She was diagnosed as diabetic and regularly took medication for that. However, she still had feelings of hunger and excessive thirst and urinated frequently. There was no hospitalization history, and she was not aware of any drug allergies. The patient had a complete maxillary denture that was made six years ago, and that was also the last time she saw her dentist. The patient brushed her teeth once a day at night with foamy toothpaste and cleaned the dentures afterwards, brushing with the same toothpaste. She did not take off the denture at night and always wore the denture during the day.

There is no familial history of similar conditions, and no hereditary disease was detected. The patient admitted that she was not in a stress condition. The patient's diet was self-reported as balanced, but she was aware that she had only consumed about two glasses of water a day. The patient was a nonsmoker and had no drinking problems.

On extra oral examination, there were fissured, irregular, red-based, yellowish-dried peeling areas on the right and left corners of the mouth measuring around 2x0.5mm (Figure 1). Intraorally, irregular white plaque lesions, multiple with different sizes varying from 0.5 to 1 cm, presented on the dorsal of the tongue and the ventral of the tongue. Atrophic surfaces also lost the normal taste buds and were replaced by smooth, reddish surfaces (Figure 2).

Figure 1. Extra orally on the corner of the mouth showed a dried yellowish crust with cracked vermillion borders. Figure 2. Whitish speckled on the dorsum of the tongue, the dried surface of oral mucosa consistent with xerostomia.

Similar athropic mucosa counterparts are also present in both buccal mucosa, measuring around 3x1.5cm. On palpation, its consistency was similar to the surrounding tissue (Figure 3). Well-defined,

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multiple atrophic lesions were presented oval, measuring 3.5x1 cm on the hard palate adjacent to the palatal alveolar ridge, red in colour with surrounding colour and consistency similar to surrounding tissue bilaterally (Figure 4).

Figure 3. Reddish atrophic lesions on the left and right buccal mucosa showed increased saliva viscosity. Saliva was reduced to sticky threads on teeth surfaces and mucosal surfaces.

Figure 4. A well-defined, multiple atrophic lesions on the hard palate, extending to the soft palate.

Based on history and clinical examination, this case was diagnosed with acute pseudomembranous candidiasis and angular cheilitis. Symptomatic treatment was to reduce pain with hyaluronic acid (Aloclair Plus oral rinse). The causative treatment was Nystatin oral suspension, referral to an internist, and supportive care in the form of lanolin and Vaseline to apply to the cracking area on both corners of the mouth.

Other than that, based on the patient's education approach, which was communication, information and education (Indonesian abbreviation was KIE), the patient was given all the information she needed to understand her condition and also helped her consider and decide what was best for her health conditions. In the communication, the patient was explained about the nature of her presentation on her mouth, that the condition in her mouth is not harmful, not a malignancy, can be cured, is not contagious, and has a good prognosis if treated accordingly.

The instructions given to the patient were to maintain oral hygiene by brushing their teeth twice a day at the right time, in the morning after breakfast and at night before going to bed, in addition to cleaning in between the teeth with dental floss and regular check-ups with the dentist at least every six months. The patient is also taught to clean her maxillary denture with gentle soap and running water. Also, the patient was given denture hygiene procedures, which included the removal of dentures during

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nighttime and soaking them in water after washing or cleaning them up. The antiseptic drug in the prescription was Aloclair mouthwash, which was used 3 times a day for plaque control. It was used after the oral hygiene routine, which involved tooth brushing. The instruction was to gargle as much as two teaspoons or about 10mL for one minute, then spit it away. Instruct the patient not to eat or drink 30 minutes after gargling. The next drug is an antifungal in the form of Nystatin oral suspension, which was to be used four times a day for two weeks. The instruction was to take 1mL of Nystatin drop on the tongue, swish it around the oral mucosa with the help of the tongue for 1-2 minutes, and then swallow it. Instruct the patient not to eat or drink for 30 minutes. The last prescription was lanolin and vaseline, applied to dry lips and mouth corners. Patient were instructed to increase their drinking intake by 2L/day or the equivalent of eight glasses. Patients were also referred to an internist.

The patient was educated about the condition of white patches on the tongue, which, in medical terms, was called acute pseudomembranous candidiasis. While the condition in the corners of the mouth is called angular cheilitis. These two conditions are caused by a fungal infection of *Candida albicans*, exacerbated by suspected uncontrolled diabetes mellitus. On examination, the patient's mouth was seen as dry and thick saliva, a feature of xerostomia. Mainly, the suspected cause of this condition, as the patient admitted, was the small amount of drinking intake, which is only two glasses a day and is aggravated by uncontrolled diabetes mellitus. Therefore, the patient was referred to an internist for further examination of her Diabetes mellitus condition. The patient was scheduled for follow-up to see if the lesion was healing, but she failed to attend.

DISCUSSION

The patient was suspected of having undermedicated diabetes mellitus based on a history of extreme hunger, excessive thirst, and frequent urination, even though she already had diabetic medication. Then, on the medical history, the patient was also prescribed Nifedipine by a general practitioner. As we know, in diabetic patients, high glucose levels in the blood would form blood clots, which in turn could lead to atherosclerosis and high blood pressure.[6] Unfortunately, the patient refused to have a further investigation related to blood sugar examination.

The diagnosis of the lesion on the patient's tongue was acute pseudomembranous candidiasis. These lesions are caused by *C. albicans*, a commensal microorganism in the oral cavity, but can become pathogenic due to changes in the oral environment and, in this case, were aggravated by high glucose levels in the blood. High and uncontrolled glucose levels will cause impaired nutritional intake for epithelial, endothelial, and acinar cells. As a result, these cells will become enlarged, causing narrowing of the lumen and microangiopathy, where blood flow will be reduced. Acinar cells, over time, became damaged and reduced saliva production, causing dry mouth. These things will contribute to the oral cavity's susceptibility to Candidal infections.[1]

In addition to these pathophysiologic processes, the patient’s oral hygiene was also compromised. She barely removed her denture, including at nighttime when sleeping. The prolonged denture-mucosa contact provides the perfect niche for Candida sp colonies. The unpolished surface significantly affects the adhesion of *C. albicans* to the denture, especially if the acrylic resin surface is rough. The accumulation of plaque and microorganisms on the polished surface supports the transition of *C. albicans* from commensal to pathogenic. In addition, the fitting surface allows the colonization of microorganisms because the environment is relatively anaerobic.[7]

The differential diagnosis of acute pseudomembranous candidiasis includes non-erosive oral lichen planus and homogenous leukoplakia. Both appeared as a white lesion, but acute pseudomembranous candidiasis can be removed by scraping, leaving erythematous and sometimes bleeding surfaces. Moreover, non-erosive oral lichen planus cannot be removed and has a characteristic feature, namely Wickham striae.[3] While acute pseudomembranous candidiasis is symptomatic, homogeneous leukoplakia is asymptomatic. The white patch in homogenous leukoplakia was also hardly removed when scraped off. The aetiology of homogeneous leukoplakia is unknown but is thought to be related to smoking.[8]

The diagnosis of lesions on the corners of the mouth was angular cheilitis. Based on the depth and number of folds, angular cheilitis is divided into 4 types. Type I is characterized by a single fissure limited to the corners of the mouth. Type II is characterized by wider and longer lesions than type I.

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Type III is characterized by multiple fissures that spread from the corners of the mouth to the surrounding skin with a limited reddish area around the fissure. Type IV is characterized by widespread erythema of the adjacent skin in the absence of fissures.[4]

Angular cheilitis in this patient was caused by *C. albicans* infection and was exacerbated by the xerostomia condition due to high blood glucose level. The condition of the patient's angular cheilitis may also be associated with the ill-fitting old dentures. The patient may also have lost the height of the vertical dimension, resulting in excessive occlusive folds at the corners of the mouth. Saliva tends to gather in that area, making it prone to maceration and fissures and increasing *C. albicans* colonies.[4]

The angular cheilitis on the corner of the mouth sometimes involve the lips and might be similar to herpes labialis. The aetiology of angular cheilitis is C. albicans and Staphylococcus aureus, while the aetiology of herpes labialis is the reactivation of the Herpes simplex virus type 1. Herpes labialis is also preceded by prodromal symptoms 6-24 hours before the lesions appear. The lesions begin as vesicles that rupture and crust within two days. The appearance of crusts at the corners of the mouth is similar to that of angular cheilitis.[9]

The second differential diagnosis of angular cheilitis is erythema multiforme. The aetiology of angular cheilitis is *C. albicans* and *S. aureus*, while erythema multiforme is viral, bacterial, or drug infection. In erythema multiforme, the lesion begins with the formation of bullae, which will later rupture and become crusted. Erythema multiforme is also accompanied by lesions on the skin called target lesions. Meanwhile, angular cheilitis is not preceded by bullae formation or accompanied by a target lesion.[8]

In this case, the patient also had a burning mouth and xerostomia. Based on anamnesis, the patient reported that the burning complaint appeared spontaneously, and the pain was felt throughout the day. Xerostomia is a concomitant symptom in patients who complain of burning mouth, with a prevalence varying between 34% and 39%. Xerostomia is characterized by hyposalivation, where the salivary flow rate is below 0.1 mL/min in unstimulated saliva or below 0.7 mL/min in stimulated saliva examined by sialometry. Salivary secretion is regulated by the sympathetic and parasympathetic nervous systems. The sympathetic nervous system regulates saliva's protein content and composition, while the parasympathetic system regulates salivary secretion volume. The patient belongs to the elderly group, in which there is usually a decline in the function of the salivary glands. When coupled with high glucose levels in diabetic conditions, it further disrupts acinar cells' function and triggers neuropathy. This would interfere with the performance of the sympathetic and parasympathetic nerves.

It was a notably significant contribution to her xerostomic condition that the patient had Adalat Oros (Nifedipine) for her hypertension. Nifedipine is an antihypertensive, classified as a calcium channel blocker, can cause xerostomia through the muscarinic M3 receptor, and causes a reduction in salivary flow. Moreover, in this patient, polyuria, as admitted, would worsen the dehydration and further compromise the salivary functions.[10–12]

The treatment approach was primarily for symptomatic therapy, which involves administering hyaluronic acid in mouthwash to overcome the stinging sensation throughout the mouth. Hyaluronic acid is a linear polymer of glucuronic acid and N-acetyl glucosamine disaccharide. The mechanism of action of hyaluronic acid is to form a protective layer around the oral cavity to protect exposed or sensitive nerve endings from excessive stimulation. Hyaluronic acid will bind to water proteins to provide protection, attract fibroblasts to accelerate wound healing, reduce tissue weakness to support the regeneration process, inhibit bacteria to relieve inflammation, and reduce capillary permeability. In addition, other ingredients, such as aloe vera as an anti-inflammatory, will reduce inflammation around the lesion and speed up healing.[13]

The causative therapy for candidiasis was by administering the antifungal drug Nystatin oral suspension and a referral to an internist to examine the suspected diabetes mellitus condition further. Nystatin is a membrane-active polyene macrolide produced by the *Streptomyces noursei* strain and available in various preparations such as suspension, topical cream, and oral pastilles. The recommended dose for children and adults is 200,000 – 600,000 IU, while in infants, it is 100,000 – 200,000 IU. Nystatin has a high affinity for ergosterol, a component of fungal cell walls, where it will interact and bind, causing pores in the cell walls and making it permeable. This will allow intracellular

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potassium to leave the cells and finally disrupt the cell's functions. Nystatin has no effect on bacteria because bacteria's cell walls do not have sterol components.[14,15]

Further treatment was for supportive therapy by administering lanolin and Vaseline as lip moisturisers. Besides its moisturiser effect to soften the skin, lanolin is an emollient that spreads easily on the skin, forming an occlusive oil layer on the epithelial stratum corneum, thereby reducing transepidermal water loss. Meanwhile, Vaseline is an occlusive type that forms a layer on the skin's surface and locks in the moisture underneath, creating the illusion of hydration.[16,17]

CONCLUSION

The common symptoms in patients with suspected high glucose levels, such as in this case, are xerostomia, burning mouth sensations, white patches related to oral candidiasis and angular cheilitis. Finding all these features warrants the dentist to send the patient for further medical examination. Patients with acute pseudomembranous candidiasis and angular cheilitis usually have underlying systemic conditions that must be addressed to eradicate *Candida albicans* successfully. This patient's challenge was that she refused further workup on her underlying conditions. Despite that, the dental professional still provided a comprehensive treatment plan and communicated it with the patient, which will help her make the right decision for her health.

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CONFLICT OF INTEREST

No conflict of interest was disclosed.

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ORIGINAL ARTICLE

Oral Manifestations among Male Smokers in Banjarmasin, South Kalimantan, Indonesia

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ABSTRACT

Background: Smoking is a risk factor for numerous diseases like cardiovascular disease, cancer, and lung disease. It also has negative effects in the oral cavity, including an increased incidence of cancer, oral mucosal lesions, periodontal disease, implant failure, dental caries, and dental staining. **Purpose:** This study aims to analyze the relationship between age, duration, and frequency of smoking with clinical manifestations of the oral cavity in smokers in Banjarmasin. **Methods:** This study utilized an analytical observational approach with a cross-sectional design. Data were gathered from the Dinas Kesehatan Office of Banjarmasin City through anamnesis and clinical oral cavity examination. Fifty-seven participants meeting specific criteria were selected using purposive sampling. Statistical analysis involved the chi-square test to examine the link between age, duration, and frequency of smoking with oral manifestations. The Fisher's exact test was employed if the data did not meet the chi-square test criteria. **Results:** The highest number of smokers were aged ≤40 years old (52.6%), the duration of smoking was found the most at the duration of >10 years (59.6%), and the frequency of smoking was higher in those who smoked more than 15 cigarettes per day (57.9%). The bivariate analysis showed that there was a significant relationship between the duration of smoking and manifestations of a smoker's palate ($p = 0.040$). A significant relationship between smoking frequency and manifestations of smoker's melanosis was shown ($p = 0.042$). **Conclusion:** The oral manifestations of male smokers included smoker's melanosis, smoker's palate, periodontal disease, and dental staining.

Keywords: male-smoker, oral manifestation, nicotine stomatitis, Kalimantan

INTRODUCTION

The estimated number of smokers is expected to reach 1.3 billion globally.[1] Indonesia has the third-highest cigarette consumers after China and India.[2] The results of Riset Kesehatan Dasar (Riskesdas) in 2013 show the national prevalence of smokers in Indonesia was 29%. The average cigarette consumption peak was for the age group of 35-44 at 11.7 cigarettes per day.[2] The prevalence of the number of smokers in South Kalimantan Province was 25.7%, with the prevalence of smoking in the population aged ≥10 years old in Banjarmasin City at 18.02%.[2] The highest smoking prevalence based on age was in the age group of 30-34 years old (30.01%).[3]

Tar, nicotine, and carbon monoxide are the three most harmful components produced by tobacco combustion[4]. The entry of chemical effects in cigarettes into the body may induce a systemic inflammatory response by stimulating the hematopoietic system, particularly the bone marrow, where the production of erythrocytes and leukocytes increases while the platelets decrease.[5] A long smoking habit impacts many organ systems, including the oral cavity.

The frequency and the length of smoking habits of each person affect the speed at which a person is exposed to abnormalities in the oral cavity caused by the increasing number of free radicals in the body.[6] The age factor also affects the occurrence of abnormalities in the oral cavity, while the elderly will experience various physical setbacks entirely.[7] Pathological conditions of the oral cavity that are frequently found in smokers include periodontal disease, halitosis, caries, dental staining, and the presentations of typical lesions on the soft tissue such as smoker's melanosis, smoker's palate, leukoplakia, and median rhomboid glossitis.[6]

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Based on the description above, the researchers conducted a study to find out the manifestations of smoking in smokers and whether there is a relationship related to age, duration of smoking, and frequency of smoking among smokers in Banjarmasin, South Kalimantan, Indonesia.

MATERIALS AND METHODS

The ethical approval of this study was given by the Health Research Ethics Commission of the Faculty of Dentistry, University of Lambung Mangkurat No. 077/KEPKGFKGULM/EC/I/2020 and a research permit was issued by related agencies. The method used in this study was analytical observational with a cross-sectional design, in which measurements and observations were performed at a particular time. The population in this study was all smokers with a minimum age of 20 years old, with a total of 3,298 people in Banjarmasin. The total research sample was 57 respondents, and the sampling was determined using a purposive sampling technique.

Inclusion criteria were active smokers for at least 1 year, a male who was at least 20 years old, no history of systemic disease, and was willing to become a respondent by signing informed consent. Exclusion criteria include subjects who were not regular smokers, refused to have an oral examination, and had impaired consciousness function. The tools used were examination sheets, stationery, mouth mirror, kidney tray (*Nierbekken*), and flashlights. The materials used were masks, disposable rubber hand gloves, and tissues. Before anamnesis and oral clinical examination, the researchers provide information regarding the advantages of the study and the procedures performed by the respondents. After respondents had approved and signed the informed consent form, the interview (anamnesis) was performed, and the clinical examination of the oral cavity was continued using a dental mirror.

The data were analyzed using the chi-square test to determine the relationship between age, duration, and smoking frequency and clinical manifestations of the oral cavity. However, if the data did not meet the requirements for the 2x2 table, Fisher's exact test would be used.

RESULTS

A total of 57 respondents were included in this study. The data obtained from this research showed respondents' sociodemographic characteristics, including age, duration of smoking, and frequency of smoking, as shown in Table 1. Table 2 lists the variants of oral manifestations, which mostly caused dental staining. The distribution of oral manifestations is based on age, smoking duration, and frequency. The statistical analysis results are shown in Tables 3, 4 and 5. Table 3 shows that there is a relationship between the smoker's melanosis and the frequency of smoking with $p<0.05$. There is no significant relationship between the smoker's melanosis and age and duration of smoking ($p>0.05$).

Variables	N	%
Age		
≤40 years	30	52.6%
>40 years	27	47.4%
Duration of smoking		
≤10 years	23	40.4%
>10 years	34	59.6%
Frequency of smoking (daily)		
≤15 cigarettes	24	42.1%
>15 cigarettes	33	57.9%

Table 1. Sociodemographic characteristics of the respondents.

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Manifestation	N	%
Smoker's melanosis	36	63.15%
Smoker's palate	28	49.12%
Periodontal disease	39	68.4%
Dental staining	46	80.7%

Table 2. Clinical manifestations in the oral cavity among smokers in Banjarmasin

	Smoker's Melanosis		
	Yes	No	Sig.
Age			
≤40 years	60%	40%	0.80
>40 years	66.7%	33.3%	
Duration of smoking			
≤10 years	52.2%	47.8%	0.25
>10 years	70.6%	29.4%	
Frequency of smoking (daily)			
≤15 cigarettes	45.8%	54.2%	0.04
>15 cigarettes	75.8%	24.2%	

Table 3. The Relationship between Age, Duration of Smoking, Frequency of Smoking and Smoker's Melanosis

	Smoker's Palate		
	Yes	No	Sig.
Age			
≤40 years	56.7%	43.3%	0.34
>40 years	40.7%	59.3%	
Duration of smoking			
≤10 years	30.4%	69.6%	0.04
>10 years	61.8%	38.25	
Frequency of smoking (daily)			
≤15 cigarettes	41.7%	58.3%	0.48
>15 cigarettes	54.5%	45.5%	

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Table 4. The relationship between age, duration of smoking, frequency of smoking and smoker's palate

Table 4 shows that there is a significant relationship between the smoker's palate and the duration of smoking with $p<0.05$. There is no significant relationship between the smoker's palate and age and frequency of smoking ($p>0.05$). Table 5 shows there is no significant relationship between periodontal disease and age, frequency of smoking, and duration of smoking ($p>0.05$). Table 6 shows no significant relationship between dental staining and age, smoking frequency, and duration ($p>0.05$).

	Periodontal Diseases		
	Yes	No	Sig.
Age			
≤40 years	63.3%	36.7%	0.55
>40 years	74.1%	25.9%	
Duration of smoking			
≤10 years	56.5%	43.5%	0.19
>10 years	76.5%	23.5%	
Frequency of smoking (daily)			
≤15 cigarettes	70.8%	29.2%	0.96
>15 cigarettes	66.7%	33.3%	

Table 5. The relationship between age, duration of smoking, frequency of smoking and periodontal disease

	Dental Staining		
	Yes	No	Sig.
Age			
≤40 years	80%	20%	1.00
>40 years	81.5%	18.5%	
Duration of smoking			
≤10 years	73.9%	26.1%	0.32
>10 years	85.3%	14.7%	
Frequency of smoking (daily)			
≤15 cigarettes	75%	25%	0.49
>15 cigarettes	84.8%	15.2%	

Table 6. The relationship between age, duration of smoking, frequency of smoking and dental staining

DISCUSSION

This research shows that there was no significant relationship between age and smoker's melanosis and smoker's palate. Oral mucosal lesions in the elderly occur because of other factors of recurrent habits besides smoking, including chewing, ill-fitting dentures, and alcohol consumption.[7] The absence of a significant relationship between age and periodontal disease can be due to organ

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function deterioration due to the ageing process.[8] This results in less effective functioning of PMN cells, a decrease in the CD4+/CD8+ ratio, and deterioration in salivary gland function as parenchymal glands are replaced by adipose cells and connective tissues. The atrophy of intermediate duct cell linings further impacts saliva IgA production.[9] In addition to the ageing process, impaired wound healing occurs due to reduced oxygen and nutrient supply to connective tissue and blood vessels and decreased collagen synthesis, rendering individuals more vulnerable to periodontal disease.[10] This study showed no significant relationship between age and dental staining. Smoking becomes one of the extrinsic factors that cause discolouration in tooth enamel. The brownish-black tar staining is due to the tobacco sap from tobacco combustion.[11] Dental staining is also caused by other factors, such as poor oral hygiene, as seen from the great quantity of calculus found during examinations. The surface of this calculus was also exposed to tobacco smoke and discoloured.[12]

In this study, there is no significant relationship between the duration of smoking and the smoker's melanosis. This result is in line with a previous study conducted by Nadeem et al., which reported that smoker's melanosis is mostly found in persons who smoked for more than 14 years.[22] While in this study, the smoking duration grouped roughly $\leq$ 10 years $\geq$ and more likely covers only a small sample size. Smoker's melanosis occurs due to increased melanin deposition in the oral epithelial layers, primarily as a protective adaptation in response to inflammatory mediators and potential carcinogenic effects caused by nicotine in tobacco products. Nicotine stimulates melanocytes, leading to melanin production.[13] The physiology of melanin pigmentation in the gingiva is affected by the number and size of blood vessels, epithelial thickness, degree of keratinization, and pigments within the gingival epithelium[14]. Yosadi et al. found that the longer the duration of smoking, the higher the melanin content.[23] Therefore, the likelihood of melanosis in the oral cavity increases with the duration of smoking.

There is a significant relationship between the duration of smoking and the smoker's palate. A smoker's palate, also known as nicotine stomatitis, is a lesion caused by physical irritation from cigarette smoke, particularly nicotine or 3-(1-methyl-2-pyrrolidinyl) pyridine with the chemical formula of C10H14N2.[15] During the smoking process, the oral mucosa could reach a temperature of 190°C. Subsequently, high temperatures come into contact with palatal mucosa and cause inflammation of the ducts of minor salivary glands.[16] Microscopically, squamous cells in the walls of the ducts of salivary glands undergo hyperplasia, and parakeratosis occurs along the ducts of salivary glands.[17]

In this study, we found no significant relationship between the duration of smoking and periodontal disease. This may be due to other factors that have a stronger influence, including the oral hygiene of the respondents. The primary cause of periodontal disease is tissue irritation due to bacteria in plaque accumulation. The development process of gingival tissue inflammation is affected by the inflammatory process's duration, onset, and intensity, which varies greatly between individuals.[21] Smoking also increases the expression of pro-inflammatory cytokines such as Interleukin-1 (IL-1), contributing to increased tissue damage and alveolar bone resorption. Nicotine content in cigarettes can influence the process of proliferation, binding, and chemotaxis of periodontal ligament cells. This causes some pathogenic microorganisms to bind to epithelium easily.[9] Based on a study by Rohmawati et al., the duration of smoking of $\geq$10 years had a three times greater risk of having periodontal disease status,[24] which our study failed to capture due to sample size.

This study also shows no significant relationship between the duration of smoking and dental staining. Dental staining is caused by retention of tar and nicotine components in teeth and furfural reactions of acetaldehyde in cigarette smoke with glycoprotein of the pellicle of amino groups[18]. The absence of a significant relationship between the duration of smoking and the incidence of stain formation in this study was probably caused by the fact that most of the respondents' oral hygiene was poor. It has been reviewed by Bastian and Reade[25] that dental staining was not accumulated and affected by the duration of smoking and the number of cigarettes smoked but may depend on the number of bacteria in the dental plaque that absorbs tobacco combustion products (tar) and attached to the tooth surface.[12] The absence of a significant relationship between smoking frequency and dental staining could be caused by each individual's duration, frequency, and oral hygiene habits. The study conducted by Mubeen et al.[18] found that dental staining was almost twice as much in smokers than

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nonsmokers. This is relevant to the study by Khalisa et al., which revealed that respondents who smoked>10 cigarettes daily had more stain formation.[12] Furthermore, another study by Oktanauli et al. also stated that teeth discolouration occurs in all categories of smokers, ranging from light to heavy smokers, regardless of the type of cigarette with filters and non-filters (kretek).[11]

There is a significant relationship between the incidence of smoker's melanosis and the frequency of smoking. The effects of cigarettes on oral mucosa are influenced by numerous factors, including the number of cigarettes smoked, the duration of smoking, the type of cigarettes smoked, and the depth of the cigarette suction.[14] Nicotine in cigarettes stimulates melanocytes in oral mucosa, producing excessive melanin, resulting in brown pigmentation of the buccal mucosa and gingiva.[19] The amount of melanin produced by melanocytes is genetically determined, and several pathways, including the adrenaline/ β2-adrenoceptor/cAMP/MITF pathway, the α-MSH/MCrR/cAMP/MITF pathway, and the main regulator of the β-endorphin/μ-opioid-receptor/PKCβ isoform signalling pathway, have been identified as main regulators[20]. DOPA chrome, which forms DHI-2-carboxylic acid (DHICA), will produce DHICA-melanin with a light brown colour. In the expression phase, melanosomes are transferred from melanocytes to keratinocytes, skin cells above melanocytes in the epidermis. Subsequently, the melanin colour is finally visible on the surface of the skin[14]. The results of this study are in line with Behura et al.,[6] that smoking >15 cigarettes a day has a risk of oral mucosal lesions 22.9 times higher compared to those who smoke ≤15 cigarettes per day.

There is no significant relationship between the frequency of smoking and the incidence of a smoker's palate. The aetiology of a smoker's palate or nicotine stomatitis is the continuous irritating effect of heat and chemicals in cigarette smoke, especially tar, nicotine, and carbon monoxide. The high temperature during cigarette burning leads to inflammation of the minor salivary glands on the palatal mucosa.[17]

CONCLUSION

Based on the results of this study, it can be concluded that there is no relationship between age and clinical manifestations of smoking in the oral cavity between smokers. Whereas in this study, the duration of smoking significantly contributes to the formation of nicotine stomatitis or smoker's palate, it has less effect on the formation of smoker's melanosis, periodontal diseases, and dental staining. The frequency of smoking, on the other hand, is significantly related to the smoker's melanosis. Further study with more subjects was needed to make a strong conclusion.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this original report.

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ORIGINAL ARTICLE

The Correlation of Insomnia to Hyposalivation and Xerostomia in the Elderly. A Single Centre Study

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ABSTRACT

Background: The ageing process declines organs functions and disrupts circadian rhythms, resulting in insomnia. The salivary gland's functions are affected by insomnia as well. Disorders of salivary secretion, such as xerostomia and hyposalivation, are associated with low salivary function levels. **Objective**: This study investigates the relationship between xerostomia, hyposalivation, and insomnia in the elderly. **Method**: This study is analytical observational research using a cross-sectional approach. A total of ninety-one residents of Cipayung's Tresna Werdha Budi Mulia 1 nursing home were the subjects of the study. The Summated-Xerostomia Inventory (SXI-id) questionnaire was utilised to measure xerostomia, the Insomnia Severity Index (ISI) was employed to measure insomnia, and the unstimulated salivary flow rate based on the spitting method was used to measure salivation. Data analysis was conducted using Spearman's correlation test. **Result**: A significant linear correlation was observed between the insomnia score and unstimulated salivary flow rate (r=-0.370; p=0.001) and between the insomnia score and the xerostomia score (r=0.682). **Conclusion**: In elderly people, salivary gland secretion might be impacted by insomnia.

Keywords: elderly, hyposalivation, insomnia, salivary flow rate, xerostomia

INTRODUCTION

As people age, various aspects of their lives are affected, with health being a significant concern. Ageing brings about several changes, including reduced cell and organ function and a fall in salivary gland function. This decline in bodily functions associated with ageing can lead to disruptions in circadian rhythms, which may result in insomnia or sleep disturbances. The impact of insomnia on the elderly, particularly its relationship with hyposalivation and xerostomia, is a crucial area of study.[1] which in turn causes an elderly person's salivary output to decline.[2,3] Due to decreased salivary gland function, elderly people frequently experience xerostomia and hyposalivation. It is known that 85.7% of older people have xerostomia, according to studies by Tawas et al. The International Dental Federation (IDF) reports that an objective decrease in salivary flow, or hyposalivation, affects 50% of people aged 40 or older. This number rises to 70% among the elderly population 70 years of age and above.[3]

The decline in organ functions associated with ageing can lead to disruptions in circadian rhythms, which may result in insomnia or sleep disturbances.[2–4] Sufficient sleep duration constitutes an additional critical determinant of an individual's overall health and quality of life.[5] Sleep disturbances are reported in approximately one-third of the adult population, with 6-10% exhibiting symptoms corresponding to insomnia disorders.[6] According to an Aging Multicentre study, 42% of 9,000 elderly adults aged 65 and older reported insomnia symptoms.[18] The geriatric insomnia prevalence rate in Indonesia is approximately 67%, based on the data from Dinas Kesehatan.[19]

As an outcome of insomnia, the concentration of the hormone cortisol is elevated, which subsequently suppresses the synthesis of melatonin. This disruption in bodily regulation is correlated with a decline in the functionality of the salivary glands.[7] With insomnia, it is well known that the salivary flow rate decreases.[8] This study aims to determine the relationship between insomnia and hyposalivation in the elderly based on salivary flow rate; similarly, the Summated Xerostomia Inventory (SXI) questionnaire will be used to determine the relationship between insomnia and xerostomia in the elderly.

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RESEARCH METHODS

This is a cross-sectional observational study employing analytic methodology. The Tresna Werdha Budi Mulia 1 Nursing Home, located in the Cipayung District of East Jakarta, was the site of this study. The participants of this research were nursing home-dwelling seniors aged 60 years or older who met the following inclusion criteria, including the ability to understand and answer the questionnaire and the willingness to sign an informed consent document. The exclusion criteria: (1) diseases such as Sjogren's Syndrome, salivary gland tumours, post-radiation head and neck tumours, sialadenitis, or others that could impair salivary function; (2) under medications that could interfere with salivary secretion or radiation therapy; and (3) alcohol consumption and or smoking.

The instruments utilized in this research comprised the Indonesian adaptations of two questionnaires: the Summated-Xerostomia Inventory (SXI-Id)[9] and the Insomnia Severity Index (ISI)[2] for assessing insomnia and hyposalivation, a measuring tube for sialometry. The SXI-Id questionnaire contains five questions with Likert scale options from 1-5. The Indonesian version of the ISI questionnaire contains seven questions with Likert scale options from 0-4. The XSI and ISI scores are the sum of the answers obtained. The salivary flow rate was measured for three minutes at 30-second intervals without stimulation using the spitting method.

DATA ANALYSIS

The statistical software SPSS version 27 was utilized to analyze the SXI-Id score, ISI score, and unstimulated saliva flow rate value following the Spearman correlation test. The relationships between xerostomia and insomnia, hyposalivation and xerostomia, and insomnia and hyposalivation were analysed.

RESULTS

Purposive sampling was utilized to obtain a research sample of 91 elderly residents residing in the Budi Mulia 1 nursing home who satisfied the inclusion and exclusion criteria. The demographic status of the research subjects yielded the following results: 63 subjects (69.2%) identified as female, and 28 subjects (30.8%) identified as male. Subsequently, the subjects were categorized into three age categories according to WHO classification. It was observed that the largest proportion of subjects belonged to the elderly group, specifically those aged 60-74 years (Table 1).

Table 1. Distribution of Frequencies According to Demographic Status

	Variable	n	%
Classification of elderly*	Elderly (Aged 60-74)	80	87.9
	Old (Aged 75-90)	11	12.1
	Very old (Aged >90)	0	0.0
Gender	Female	63	69.2
	Male	28	30.8

*Based on the WHO classification of the elderly individuals

Based on the results obtained from the ISI questionnaire, 79 participants out of the 91 elderly samples were found to have insomnia, representing 86.8% of the sample. The prevalence of moderate insomnia among the samples is well-documented, affecting 32 samples (35.2%) (Table 2). Forty of the 91 elderly samples were found to have severe xerostomia (44%), as determined by the SXI-Id questionnaire results. Both moderate and severe could be considered xerostomic in 67 out of 91 subjects (72.5%) (Table 3).

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Table 2. The frequency distribution of insomnia states was determined using the ISI questionnaire.

State of Insomnia*	n	%
No Insomnia	12	13.2
Mild Insomnia	28	30.8
Moderate Insomnia	32	35.2
Severe Insomnia	19	20.9
Total	**91**	**100**

* Was determined by the ISI questionnaire. 0–7 indicates the absence of clinical insomnia symptoms; 8–14 indicates mild insomnia; 15–21 indicates moderate insomnia; and 22–28 indicates severe insomnia.

Table 3: Distribution of xerostomia frequencies according to SXI-Id questionnaire scores.

State of Xerostomia*	n	%
Mild Xerostomia	24	26.4
Moderate Xerostomia	27	29.7
Severe Xerostomia	40	44.0
Total	**91**	**100**

* According to the SXI questionnaire results. A score of 5-10 indicates mild xerostomia, 11-15 indicates moderate xerostomia and 16-25 indicates severe xerostomia.

The frequency distribution of salivary flow rate for the samples assessed using the unstimulated saliva spitting method is presented in Table 4. The salivary flow rate of the samples is documented to have an average value of 0.1726 ml/min, with a range of 0 ml/min for the minimum and 0.63 ml/min for the maximum. The salivation state of the samples was classified according to the flow rate of unstimulated saliva. It was observed that a significant proportion of the samples, specifically 37 (40.7%), showed low salivation and 29 (31.9%) very low flow of saliva. These two groups would represent of majority 73.6% low salivation rate (Table 5).

Table 4. Frequency distribution of salivary flow rate

Variable	n	Minimum	Maximum	Mean
Unstimulated salivary flow rate (ml/min)	91	0	0.63	0.1726

Table 5. Distribution of salivation state

State of salivation *	n	%
Very low	29	31.9
Low	37	40.7
Normal	25	27.5
Total	**91**	**100**

* According to measurements of unstimulated salivary flow rate. A salivary flow rate of less than 0.1 ml/min is considered extremely low, 0.1-0.25 ml/min is considered low, and >0.25 ml/min is considered normal.

The scoring data obtained from the ISI questionnaire was utilized to analyze the subject's insomnia status. Salivation rate was determined by analyzing the subject's unstimulated salivary flow rate data. Xerostomia was assessed using the scoring data obtained from the SXI-Id questionnaire. The results of the correlation test between unstimulated salivary flow rate for assessing hyposalivation and

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ISI questionnaire scores for assessing insomnia are presented in Table 6. A moderate negative linear correlation (r=-0.370) was observed between unstimulated salivary flow rate and ISI questionnaire scores; hyposalivation decreased with increasing insomnia severity. The correlation test outcomes between the scores obtained from the ISI and SXI-Id questionnaires, which were utilized to evaluate xerostomia, are presented in Table 7. A moderate positive linear relationship was observed between the scores obtained from the ISI and SXI questionnaires (p=0.001; r=0.682); in other words, xerostomia became more severe as insomnia severity increased. The correlation test results between unstimulated salivary flow rate and SXI questionnaire scores are presented in Table 8. A moderate negative linear relationship was observed between unstimulated salivary flow rate and SXI-Id questionnaire score (p=0.001; r=-0.403); in other words, xerostomia became more severe as the salivation decreased.

Table 6: Relationship between insomnia and hyposalivation

Variable	n	*p-value*	*r-value*
ISI Questionnaire Score - Unstimulated Salivary Flow Rate	91	0.001	-0,370

Table 7. Relationship between insomnia and xerostomia

Variable	n	*p-value*	*r-value*
ISI Questionnaire Score–SXI-Id Questionnaire Score	91	0.001	0.682

Table 8. Relationship between hyposalivation and xerostomia

Variable	n	*p-value*	*r-value*
Unstimulated Salivary Flow Rate – SXI-Id Questionnaire Score	91	0.001	-0.403

DISCUSSION

Consistently, both the result of SXI-Id and sialometry showed 67 subjects (73.6%) and 66 subjects (72.6%) exhibited xerostomia of 91 subjects (Table 3 and Table 5, respectively). The findings of this investigation are consistent with those of Ayuningtyas et al., who examined 19 samples aged 55 years or older and discovered that hyposalivation was present in the majority of 11 (57.9%) of the 19 samples, as determined by unstimulated salivary flow rate measurements ($<0.1 \pm 0.05$ ml/min).[10] The primary cause of impaired salivary secretion in the elderly is the ageing process.[11] The function of the salivary glands in the elderly is compromised due to a reduction in the number of acinar cells within them. Consequently, saliva production and secretion decline, resulting in symptoms of xerostomia and hyposalivation.[10]

Based on the results of the ISI questionnaire, this study reveals that among 91 subjects, 79 elderly subjects (86.8%) experienced insomnia. The remaining 12 subjects (20.9%) did not report suffering from insomnia (Table 2). The findings of this study are consistent with those of Sumirta et al., who examined 30 subjects aged 55-84 years and discovered that insomnia was present in every subject.[12]

As individuals age, their body's capacity to tolerate variations in sleep-wake cycles or hours diminishes, resulting in a diminished and irregular circadian rhythm. In addition to circadian rhythm disruption, various precipitating factors contribute to insomnia among the elderly. These include stressful situations such as bereavement, residential relocation, or significant interpersonal disputes, all of which have the potential to escalate stress levels.[13]

The correlation between insomnia and hyposalivation in the elderly is significantly and strongly correlated in Table 6 ($p<0.05$). The severity of the insomnia corresponds to the severity of the hyposalivation. Subsequently, the correlation test results presented in Table 7 indicate a moderately significant linear relationship ($p<0.05$) between insomnia and xerostomia among the elderly. Moreover,

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xerostomia worsens with the severity of insomnia. Based on the outcomes of the two analyses, a correlation between insomnia and salivary secretion can be established.

The findings of this research are consistent with those of Kurniawan et al., who examined 40 samples with an average age of 32.33 ± 2.9 years. Their research revealed that mild stress was indicated by low cortisol hormone levels (0–0.5 µg/dl) in 25 samples (62.5%) that responded to the Perceive Stress Scale (PSS-10) questionnaire. These samples also exhibited a significant moderate negative linear relationship between stress-induced insomnia and salivary secretion, with a p-value of 0.013 ($p<0.05$) and an r-value of 0.36.[12]

Lopez-Jornet et al. have also conducted studies on xerostomia in subjects with sleep disorders, measuring the severity of xerostomia with the Xerostomia Inventory (XI) and the severity of sleep disorders with the Pittsburgh Sleep Quality Index (PSQI) and Epworth Daytime Sleepiness Scale (EES). The research included 30 controls and 30 subjects. The xerostomia group showed a significant difference in both the PSQI score (5.33±1.78 vs 4.26±1.01) and EES score (5.7±2.1 vs 4.40±1.7) when compared to the control group.[14] In the study by Apessos et al., PSQI scores likewise revealed a significant difference between the hyposalivation group (63 participants) and the control group (110 subjects).[15]

One of the factors that influences salivary secretion is circadian rhythm, as the volume of saliva increases during the day and diminishes at night. The total protein concentration is at its maximum throughout the day, whereas the production of sodium and chloride reaches its apex in the early morning hours. Primary salivation is when sodium and chloride production is at its apex; therefore, a disturbance in the circadian rhythm will impede primary saliva production, reducing salivary flow among individuals with insomnia compared to those with sleep disturbances.[16] Circadian rhythms have the potential to influence the hormone cortisol. Insomniacs, for instance, will experience an elevation in cortisol levels when sleep duration is suboptimal. This cortisol surge will subsequently impact the hypothalamic-pituitary-adrenal (HPA) component, which regulates salivary flow rate. Insomnia-induced elevation of cortisol hormone levels will consequently lead to a decrease in salivary secretion.[11] Due to an increase in physical and mental illnesses as well as a decline in age-related sleep quality, insomnia is more common in the elderly. Certain medications used to treat insomnia, such as benzodiazepines, also contribute to xerostomia and decreased salivary flow rate.[17]

The assessment of insomnia in this research was conducted using subjective measurement instruments, specifically the Insomnia Severity Index (ISI) questionnaire. No objective measurements were obtained, which would have provided a more comprehensive evaluation of insomnia. To assess salivation in subjects, this study also measured the unstimulated salivary flow rate; this rate indicates minor salivary gland function more than hyposalivation. Subsequently, the elderly subjects may have confounding variables, including unanalyzed systemic disorders and medications that may have an impact on the prevalence of insomnia, xerostomia, and hyposalivation. Insomnia and salivary secretion require additional investigation; this can be accomplished by using a more comprehensive measuring instrument for insomnia and stimulating salivary flow rate for salivary secretion.

CONCLUSION

A moderate negative linear correlation ($r=-0.370$; $p=0.001$) was observed between unstimulated salivary flow rate and ISI questionnaire scores. As the severity of insomnia increases, so does the severity of hyposalivation. A moderate positive linear relationship ($r=0.682$; $p=0.001$) was observed between the scores obtained from the ISI and SXI-Id questionnaires. As the severity of insomnia increases, so does the severity of xerostomia. A notable moderate negative linear correlation ($r=-0.403$; $p=0.001$) was observed between the unstimulated salivary flow rate and SXI-Id questionnaire score. Hyposalivation advances in severity with the degree of xerostomia.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL CONSIDERATIONS

The ethics committee of YARSI University has approved the ethical clearance of this research.

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