

VIRULENCE OF CANDIDA ALBICANS IN PATIENTS WITH DIABETES MELLITUS

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Abstract

Diabetes Mellitus is a predisposing factor for oral candidiasis. People with diabetes who are not well controlled, it can lead to a decrease in salivary flow rate, a decrease in salivary pH and an increase in salivary glucose levels, reduced salivary flow can increase the risk of developing lesions on the oral mucosa so that it can encourage the growth and colonization of *Candida* so that the oral mucosa with Diabetes Mellitus found *Candida albicans*. The objective of this research was to determine the virulence of *Candida albicans* with Diabetes Mellitus. This research was conducted using a descriptive survey design. The number of samples were 32 patients of diabetes mellitus in Puskesmas Padang Serai Kota Bengkulu, which taken by total sampling. Samples were examined macroscopically using Sabouraud Dextrose Agar media and microscopic examination using Potassium Hydroxide. The results showed that 17 respondents (53.1%) were positive for *Candida albicans* on the oral mucosa swab and 15 respondents (46.9%) were negative for *Candida albicans* on the oral mucosa swab. This percentage value indicates that most of the oral mucosal swab samples with diabetes mellitus have *Candida albicans*. It is recommended to keep blood sugar levels under control and maintain oral hygiene such as cleaning the mouth after eating in the morning and going to bed at night, and consuming foods containing lots of water.

Key Words: *Candida albicans*, Diabetes Mellitus

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic diseases characterized by high levels of glucose in the blood (hyperglycemia) due to insulin secretion abnormalities, insulin working abnormalities, or a combination of both (Saskia & Mutiara, 2015). Continuous high blood glucose levels cause damage to blood vessels that commonly affect the heart, eyes, kidneys and nerves and cause various complications (Saskia & Mutiara, 2015). Epidemiological studies show that the prevalence of DM increases with age. From the data of the *World Health Organization* (WHO) it is found that after reaching the age of 30 years, blood glucose levels can rise 1-2% when fasting and can rise by 5.6-13% at 2 hours after eating. Along with increasing age, the elderly experience physical and mental deterioration which has many consequences. In addition, the elderly also experience special problems that require attention, among others, are more vulnerable to macrovascular and microvascular complications of DM and the presence of geriatric syndrome (Kurniawan, 2010).

The aging process in the elderly results in a decrease in bodily organs and various other physical changes. One of the changes that occur in the elderly due to a decrease in the function of organs and a decrease in cell function is a change in the oral cavity. People who have entered the elderly group generally will experience a decrease in salivary production, causing a change in the composition of saliva. Production of saliva decreases and results in complaints of dry mouth or xerostomia. Xerostomia is experienced in the elderly and several causes are systemic diseases and treatment (Tampubolon, 2017).

Diabetes mellitus that is not diagnosed, uncontrolled, or those with poorly controlled diabetes mellitus will experience manifestations in various organs including the oral cavity. The oral cavity of a person with Diabetes Mellitus will feel uncomfortable because saliva secretion is less than normal and the patient feels his mouth becomes dry (Xerostomia) (Walukow, 2013). High blood glucose levels (hyperglycemia) can cause elevated skin glucose levels in patients with diabetes mellitus, thereby facilitating the appearance of skin dysfunction in the form of dermatitis, bacterial infections and fungal infections. The condition of epithelial and mucous cells in patients with diabetes mellitus also has increased adhesion to several pathogenic microorganisms such as *Candida albicans* in the mouth (Walukow, 2013).

Candida albicans can turn into pathogens if changes occur in the host. Changes that occur in the host can be both local and systemic. This candidiasis lesion can develop in each oral cavity, but the most frequent location is the buccal mucosa, buccal mucous folds, oropharynx and tongue. Chronic candidiasis that is not treated immediately can develop into pre-malignant candidiasis leukoplakia, and then result in squamous cell carcinoma. In addition, candidiasis can develop into a systemic infection through lymph flow that attacks vital organs such as the kidneys, lungs, brain and blood vessel walls that are fatal (Hakim & Ramadhian, 2015).

Diabetes mellitus with Xerostomia is a predisposing factor for the onset of oral candidiasis. If a person has diabetes that is not well controlled, it can result in a decrease in the flow rate of saliva, a decrease in salivary pH and an increase in glucose levels of saliva, reduced salivary flow can result in Xerostomia. Patients with frequent conditions of Xerostomia can increase the risk of lesions in the oral mucosa so that it can encourage growth and colonization of *Candida* (Vikholt, 2015).

METHOD

Research Design and Subject

This research was conducted using descriptive survey design. The sampling technique uses total sampling with 32 samples were identified.

Instruments and Data Analysis Techniques

Samples were examined macroscopically using Sabouraud Dextrose Agar (SDA) media and followed by microscopic examination using Potassium Hydroxide (KOH). Data analysis was carried out descriptively, by knowing the presence or absence of *Candida albicans* in patients with diabetes mellitus in 2019.

RESULTS

The results of univariate analysis were used to see the frequency distribution of *Candida albicans* in people with diabetes mellitus. It can be seen in the following table:

Table 1 Results of Frequency Distribution of Identification of *Candida albicans* in Patients with Diabetes Mellitus

| Examination Method | Positive (+) Percentage (%) | Negative (-) Percentage (%) | Total Percentage (%) |
|---------------------------|------------------------------------|------------------------------------|-----------------------------|
| Macroscopic (SDA) | 17 (53.1%) | 15 (46.9%) | 32 (100%) |
| Microscopic (KOH) | 17 (53.1%) | 15 (46.9%) | 32(100%) |

Table 1 showed that the respondents became the research sample, *Candida albicans* was found on the oral mucosa of people with Diabetes Mellitus in 17 respondents (53.1%) by means of macroscopic and microscopic examination, while on the oral mucosa swab of people with Diabetes Mellitus *Candida albicans* was not found. *albicans* in 15 respondents (46.9%). Of the total sample studied as many as 32 respondents

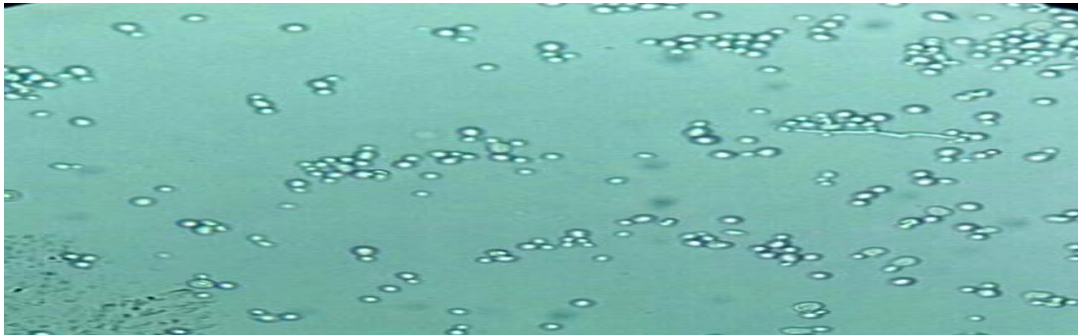


Figure 1. Results of Examination of *Candida albicans* in people with Diabetes Mellitus

DISCUSSION

The positive results of *Candida albicans* in 7 men and 10 women with diabetes mellitus if associated with the theory, women are more susceptible to autoimmune diseases due to hormonal cycles. Hormones are a component of the neuroendocrine system that can affect immunity. The hormones estrogen and prolactin are proinflammatory cytokines whose fluctuations can interfere with the tolerance of the cells themselves, so that they can trigger autoimmune diseases. This condition is in accordance with the study (Getas *et al.*, 2013) saying the prevalence of candidiasis by 20.5% in 44 female respondents with diabetes mellitus with the results of analysis of *Chi square* bivariate test data obtained a probability value of 0.002; (Walukow, 2013) From a population of 108 people with type 2 diabetes mellitus 92 people (85%) experienced xerostomia and *Candidiasis* with fasting blood sugar levels ≥ 100 mg / dl, blood sugar levels 2 hours after meals 40140 mg / dl and long suffering from diabetes varies.

Based on the age level found positive *Candida albicans* in the elderly (61-70) years as many as 17 people. Old age is characterized by the aging process. Aging is a process of slowly disappearing the ability of cells or tissues to repair themselves or replace themselves and maintain their normal structure and function so they cannot survive infection and repair the damage suffered. Decreasing cell function causes easier health problems in the elderly (Jayanti & Jirna, 2018). *Candida albicans* was found most in the range of 1-10 years, namely as many as 16 people. According to (Jayanti & Jirna, 2018) Complications cause a decrease in the quality of life for people with DM. Another thing is also because diabetes is often not detected or starts with diabetes is 7 years before being diagnosed, so that morbidity and mortality occur in undetected cases. In this study also found the growth of *Candida albicans* in DM patients who had suffered more than 20 years. On average, symptoms of complications occur > 20 years after an increase in blood sugar levels.

Virulence of Candida Albican in Patients with Diabetes Mellitus

The result of research conducted by (Hakim & Ramadhian, 2015) in patients with HIV / AIDS with oral candidiasis showed that pseudomembranous candidiasis caused by *Candida albicans* is the most common type found in 76.7% of 30 patients. However, in patients with diabetes mellitus with Xerostomia, erythematous candidiasis is more common in people with DM with Xerostomia, this is in accordance with the theory said by (Hakim & Ramadhian, 2015) erythematous candidiasis often associated with dry mouth complaints (Xerostomia) in patients, with a clinical appearance that is erythema or redness in the area around the base of the lesion; (Zengin et al., 2015) as many as (43%) patients still experience poor oral hygiene. Until showing a high prevalence of Xerostomia (56%) caused by *Candida albicans* (11.8%). People with uncontrolled diabetes mellitus suffer from major defense cell function abnormalities.

Polymorphonuclear leukocytes are the main defense cells in the periodnosium. The functions of cells involved in this defense response are neutrophils, monocytes and macrophages. Patients with DM experience the main defensive cell disorder because of the imbalance of the function of chemotaxis and phagocytosis which causes DM patients to be more susceptible to infection. High blood sugar levels also damage the system, thereby reducing the sensitivity of patients to the presence of *Candida Albican* fungal infections (Ndraha, 2014).

Diabetes mellitus is a metabolic disorder with clinical manifestations of loss of carbohydrate tolerance (Getas et al., 2013). This situation is caused by a lack of the hormone insulin produced by the pancreas or the malfunctioning of the hormone insulin in maximizing sugar. Diabetes mellitus is one of the predisposing factors for the onset of candidiasis. Candidiasis is caused by *Candida albicans*, the most common etiological species in cases of fungal infections. *Candida albicans* infection in Lanisa DM patients can be influenced by several factors, namely endogenous factors and exogenous factors (Putri et al., 2013).

Endogenous factors that cause candidiasis in elderly people with diabetes mellitus due to increased blood sugar and urine levels. These levels can stimulate the growth of *Candida albicans* mushrooms faster. Factors of obesity can also cause candidiasis. This obesity causes a lot of perspiration, causing skin maceration and this facilitates the invasion of *Candida albicans* and other diseases (Putri et al., 2013). Exogenous factors include weather and humidity factors. Weather and humidity affect the growth of *Candida albicans*, which is the weather with a hot climate that causes a lot of sweat, especially in the folds of the skin. This will cause the skin to be macerated and this will facilitate the invasion of *Candida albicans*. Work

related to water and personal hygiene greatly affects the invasion and level of infection with *Candida albicans* (Putri et al., 2013).

Candida albicans fungal infections in people with diabetes mellitus are associated with high blood sugar levels and skin sugar. According to (Saskia & mutiara 2015), mushrooms are consumer microorganisms that rely heavily on a medium that provides carbohydrates, proteins, vitamins and other chemical compounds, which are obtained by absorbing the required elements from the environment through hyphae systems. Skin sugar levels are 55% of blood sugar levels in people who are not diabetic, whereas in diabetics the ratio increases to 69% - 71% of blood glucose which has increased. In patients who have already been treated, the ratio exceeds 55%. The condition of hyperglycemia also causes disruption of the immunoregulation system mechanism. This results in decreased chemotactic power, phagocytosis and bactericidal ability of leukocyte cells so that the skin is more susceptible to infection.

There is a relationship between blood glucose levels and the growth of *Candida albicans* in the oral mucosa of patients with uncontrolled diabetes mellitus. *Candida albicans* is still found in patients with diabetes mellitus who have been treated, but these patients still have blood sugar levels above normal (Jayanti & Jirna, 2018) . This study supports the results of the study, which found that there was an increase in *Candida* colonization of the oral mucosa of Diabetes patients compared to normal people. There is a relationship between increased glucose levels in the occurrence of oral Candidiasis in patients with Diabetes Mellitus.

Elderly people with Diabetes Mellitus with Xerostomia can reduce or prevent the occurrence of candidiasis by maintaining a healthy lifestyle. Maintaining a healthy lifestyle is one of the factors that can control blood sugar levels in elderly people with DM so that with controlled sugar levels can reduce the source of nutrient intake in the growth of *candida albicans* (Getas et al., 2013). Oral hygiene is an important factor that can cause candidiasis. Maintaining oral hygiene, namely multiplying the consumption of water, cleaning the mouth after breakfast and when going to sleep at night, and eating foods that contain lots of water. It aims to maintain the cleanliness of the saliva flow rate and elderly oral hygiene of patients with DM with Xerostomia so as to reduce the incidence of candidiasis caused by *Candida albicans* (Damayanti, 2014).

CONCLUSIONS AND SUGGESTIONS

The results showed that most of the respondents were positive for candidiasis on the oral mucosa of people with diabetes mellitus and almost most of the respondents were negative for candidiasis, from the total sample studied, 32 samples. It is recommended to keep blood sugar levels under control and maintain oral hygiene such as cleaning the mouth after eating in the morning and going to bed at night, and consuming foods containing lots of water.

REFERENCE

- Cho, NH, Shaw, JE, Karuranga, S., Huang, Y., da Rocha Fernandes, JD, Ohlrogge, AW, & Malanda, B. (2018). *IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Research and Clinical Practice, 138*, 271–281.
- Farizal, EA, & Serbasa, D. (2017). Identification of *Candida Albican* in Saliva of Women with DM. *Www.Teknolabjournal.Com*, 6 (74), 67-2338.
- Hakim, L., & Ramadhian, MR (2015). *Oral candidiasis. Majority, 4* (9), 53–57.
- IW Getas, IBR Wiadnya, and LA Waguriani, Effect of Glucose Addition and Time of Incubation on SDA Media (Sabaroud Dextrose Agar) Against Mushroom Growth *Candida albicans*, *Media Bina Ilm*, Vol. 8, no. 1, pp.51–7, 2014
- Jayanti, S.K, & Jirna, I.N (2018). Isolation of *Candida albicans* from oral mucosal swabs of patients with type 2 diabetes mellitus. *Journal of Laboratory Technology, 7* (1), 1.
- Kurniawan, I. (2010). *Type 2 Diabetes Mellitus in the Elderly*. Public Health, 576–584.
- Manurung, AKW (2012). *Effect of Xerostomia on Dental and Oral Health Regarding Quality of Life in Usila*. Diponegoro University Medical School, Semarang. ,
- Mutiawati, VK (2016). Microbiological examination of *albicans candida*. *Syiah Kuala Medical Journal, 16* (1), 53–63.
- Nasution, M. (2008). Department of Oral Biology, Faculty of Dentistry, University of North Sumatra, Medan, 41 (3).
- Ndraha, S. (2014). *Type 2 Diabetes Mellitus and Current Management. Medicinus, 27* (2), 9-16
- Nur'aeny, N., Hidayat, W., Dewi, TS, Herawati, E., & Wahyuni, IS (2017). *The oral candidiasis program in the RSHS Bandung oral disease department for the period 2010-2014*. Indonesian Dentistry Magazine, 3 (1), 23.
- Putri, AU, Kelurahan, JI, Ilmu, F., Dan, K. and Hasanuddin, U. (201). Potential Test for Antifungi of Various Types of Seagrass Extracts on Fungi of *Candida albicans*

- Saskia, T., & Mutiara, H. (2015). *Fungal infections in people with diabetes mellitus. Majority*, 4 (November), 69–74.
- Simanjuntak, FMO (2015). *Examination of urea levels in people with diabetes mellitus aged 55-65 years in rsu. 2015 field pearl sari* Medicine and Health.
- Stasya, Elma. Dian Nurmansyah, DR (2018). *Candida albicans infection in Oral Swab of Diabetes Mellitus Patients at Ratu Zalecha Martapura Hospital in June 2018*, (1).
- Tampubolon, T. (2017). *The impact of xerostomia on the quality of life of elderly women in the elderly poly health center in Darussalam Medan*.
- Vikholt, KJ (2015). *Oral candidiasis and molecular epidemiology of Candida glabrata. University of Oslo Faculty of Dentistry*.
- Walukow, WG (2013). *Xerostomia in Patients with Type 2 Diabetes Mellitus in the Polyclinic*, 1–5.
- Z. Zengin, K. Yanik, P. Celenk, Z. Unal-Erzurumlu, H. Yilmaz, and N. Bulut, "Oral hygiene and oral evaluation in psychiatric patients in nursing homes in Turkey, *Niger. J. Clin. Pract*, Vol. 18, no. 6, pp. 751–756, 2015.