

Hyperglycemia as Predisposition Factor of Oral Candidiasis on patient with Diabetes Mellitus

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ABSTRACT

Diabetes mellitus is a disease characterized by hyperglycemia or an increase in blood glucose levels. The state of hyperglycemia is one of the supporting factors for oral candidiasis infection. The purpose of this study was to determine the correlation of hyperglycemia with the incidence of *Candida albicans* infection in patients with Diabetes mellitus. this study was conducted on 30 respondents. Blood glucose levels and *Candida albicans* culture were measured using the germ tube test method. Data analysis to see the correlation using the Chi-Square test obtained Sig. (0.015 0.00.050) and it can be stated there is a correlation between variables. From the results of data analysis, it can be concluded that there is a correlation between hyperglycemia and *Candida albicans* infection which causes oral candidiasis in DM patients.

Keywords: oral candidiasis, diabetes mellitus, hyperglycemia, blood glucose, *Candida albicans*

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INTRODUCTION

Diabetes mellitus (DM) is the most common metabolic syndrome disease suffered by modern society because of lifestyle influences. Patients with diabetes mellitus (DM) enhance the risk of colonization *Candida albicans* in the oral and / or vaginal mucosa and urinary tract (Nitzan et al., 2015). DM can be followed with comorbid diseases infections caused by microorganisms, one of the most common causes of infection is *Candida albicans* (Ship, 2003). *Candida albicans* is a fungal infection that can be found on human skin and mucosa, about 20% - 50% of this species is found in healthy humans as microflorabnormal (Taheri et al., 2014).

Oral candidiasis often establish in DM patients. Polymorphonuclear leucocyte deficiency and reduced salivary secretion enhance risk factors of oral candidiasis (Kadir et al., 2002). High blood glucose level (hyperglycemia) is also one of the factors that triggers the occurrence of *Candida albicans* colonization in patients with DM (Wilson & Reeves, 1986). Some of these factors are able to affect the balance of yeast and host cell, this imbalance will trigger changes in the nature of *Candida albicans* into pathogens and cause infection, the mouth will become oral candidiasis and in the genital organs can cause vulvovaginitis candidiasis.

The aim of this study is to determine the correlation between the state of hyperglycemia and the incidence of *C. albicans* infection in patients with diabetes mellitus.

MATERIALS AND METHODS

This study used analytic survey and purposive sampling as a sampling technique with the criteria of the patients with DM types 1 and 2. The study conduct at Ratu Zalecha Martapura Hospital in Banjar accordance with the license number SK.24/LAB RS RZ/2018.

Materials

This study used Incubator (Mettler™ UNB-400), Hot Plate (Thermo Cimarec), Sterile Swabs and materials used Sabouroud Dextrose Agar (SDA) Media (Merck), Lactophenol Cotton Blue (LPCB), Chloramphenicol, Aquadest, Serum Albumin, NaCl 0.9%, and Alcohol 70%.

Procedure

Blood sampling and serum production

Blood samples occupy from median cubital vein to the tube of 3 mL, collected into a red lid vacuum tube. Centrifugation is done at a speed of 3000 rpm for 15 minutes.

Measurement of glucose levels

Glucose level measurements were carried out using the GOD-PAP method, with a Biosystem BTS-350 spectrophotometer. The examination of serum sample occupy from the respondent's blood.

Swab Sampling

Swab mouth of DM patients occupy used sterile swabs moistened with 0.9% NaCl, then put into NaCl 0.9% 5 mL and inserted into the icebox.

Colony Growth and Confirmation Test of Candida albicans

Oral swab samples were inoculated on SDA media, incubated at 25°C for 5 days. The suspect colony of *Candida albicans* with white / beige characteristics with a convex surface was occupy and examined with LPCB. Positive results found yeast cells (yeast) with pseudo hyphae.

Identification of Candida albicans species by germ tube test

The suspect colony occupy and inoculated in serum albumin. Incubated and observed in 3 hours under microscop, the result obtained by germ cell (germ tube).

Data analysis

Data analysis using Chi-Square tes on SPSS application ver. 25.

RESULT AND DISCUSSION

The results of serum blood glucose level of the respondents and the culture of *Candida albicans* in the mouth swab of 30 respondents obtained the percentage results as in Figure 1 and Figure 2.

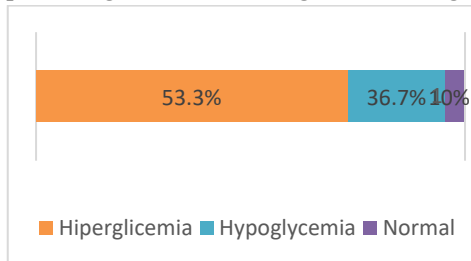


Figure 1. Graph percentage of glucose level respondents

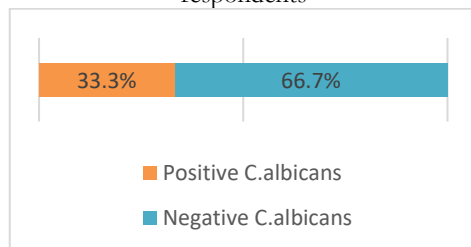


Figure 2. Graph of percentage *Candida albicans* respondents

The number of respondents with hyperglycemia was 16 respondents (53.3%) and positively infected with *Candida albicans* in the mouth as many as 11 respondents (33.3%).

Candida albicans examined using SDA media. The suspect colony results on 11 plates in order to obtain a colony with identical characteristics to the *Candida* sp colony, which is a creamy rounded colony with a convex surface (Harina, 2002). the colony was identified by painting using LPCB obtained by blastospores and pseudo hyphae as presented in Figure 3.

The correlation state of blood sugar levels with *Candida albicans* infection rates that cause oral candidiasis, a statistical analysis was performed with the Chi-Square test. The test results obtained Sig value ($0.015 \leq 0.050$) so that the hypothesis is accepted and it can be concluded that there is a correlation of hyperglycemia conditions with *Candida albicans* infection rates.

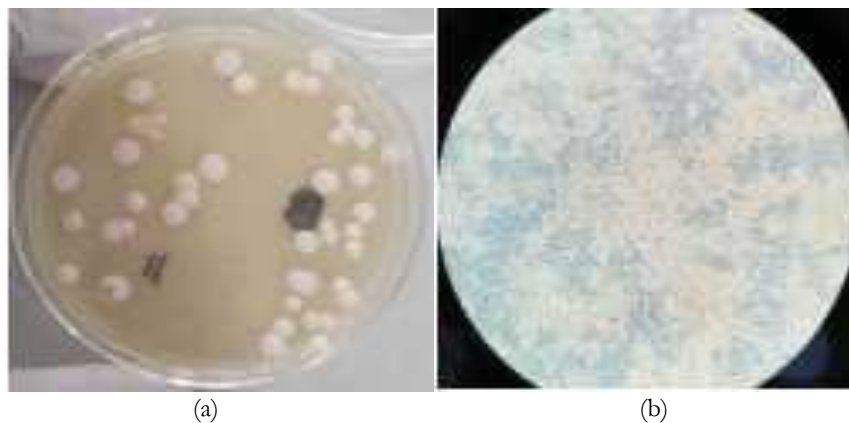


Figure 3. Suspect colony of *Candida albicans* and the results of microscopic examination (a) colony form of *Candida albicans* on Sabouroud Dextrose Agar(SDA) (b) germ tube test positive result

Candida albicans in normal circumstances is normal flora, where *Candida albicans* were balanced state with bacterial flora. (Bhavan, et al., 2010) Candidiasis of *Candida albicans* species attacks all ages male and female have a variety of clinical picture and can affect the mouth, vagina, skin, nails, bronchi or lungs, sometimes causing septicemia, endocarditis or meningitis (Putri et al., 2011; Kuswadji, 2015)

The results showed a correlation between hyperglycemia and the incidence of oral candidiasis infection in patients with positive DM. This result is supported by a statement stating that one of the causes of an increase in the number of colonies of *Candida albicans* in the mouth is high blood glucose levels, high blood sugar levels make *Candida albicans* easier to multiply (Hammad et al., 2013). High glucose levels also play a role in

suppressing the killing capacity of neutrophils, so that the colonization of *Candida albicans* can occur more easily (Darwazeh et al., 1990). The condition of hyperglycemia can also cause immunoregulatory system disorders due to decreased chemotactic power, phagocytosis and bactericidal ability of leukocyte cells enhance the risk of infection in the skin tissue (Jayanti & Jirna, 2018). The activity of phagocytes by leukocyte cells is also influenced by the control of blood glucose levels. In DM patients with normal glucose level, there is an enhancement in the phagocytic activity of leukocyte cells. This supports the results of this study, in patients with hypoglycemic glucose levels as much as 36.7% of *Candida albicans* culture results were negative. In a state of hyperglycemia, changes in the oral cavity become more acidic due to increased glucose in saliva and acid formation also enhanced. This situation is a factor that supports the change in the nature of *Candida albicans* from commensal organisms to pathogenic organisms (Balan, et al., 2015). *Candida albicans* infection generally occurs due to colonization by this fungus in the oral mucosa. Some factors which are thought to enhance the ability of *Candida albicans* to colonize are increased salivary pH, history of xerostomia, and poor personal hygiene (Dehghan et al, 2016). *Candida albicans* examination in DM patients both type 1 and type 2 plays an important role in the management of DM patient therapy.

CONCLUSION

Based on the results of this study that has been done we can be concluded that the state of hyperglycemia is correlated with *Candida albicans* infection in patients with Diabetes Mellitus.

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