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Association of Diabetes Mellitus and Estrogen Hormone Levels with Vaginal Candidiasis

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Abstract

Objectives: The aim of this study was to investigate the association of diabetes mellitus and estrogen hormone levels with vaginal candidiasis.

Method: A cross sectional comparative study was used on 2018 from women of childbearing age (20-35 years) and one-year oral contraceptive who came to the obstetric polyclinic who conducted visual inspection with acetic acid (VIA) in Bhayangkara Hospital Polyclinic, Padang Pasir and Nanggalo Primary Health Care Padang City, West Sumatera Province, Indonesia. We recruited 58 respondents with consecutive sampling technique. Vaginal candidiasis was measured using vaginal secretions and microscopic laboratory test. Diabetes mellitus was measured using fast blood glucose and estrogen hormone levels measured with blood sample analysis using Enzyme-Linked Immunosorbent Assays (ELISA). Chi-square test and independent sample T test were used to data analysis, P value <0.05 was considered as statistically significant association. Data were processed using IBM SPSS Statistics 24.0.

Results: Diabetes mellitus was associated with vaginal candidiasis ($p < 0.05$). There was statistically significant mean difference of estrogen hormone levels with vaginal candidiasis, estrogen hormone levels with vaginal candidiasis were 143.39 pg/ml higher than not vaginal candidiasis were 60.99 pg/ml.

Conclusion: This analysis confirmed association of diabetes mellitus and estrogen hormone levels with vaginal candidiasis.

Keywords: *Candida albicans*, diabetes mellitus, estrogen hormone, vaginal candidiasis.

Introduction

One of the reproductive tract infections in women is vaginal candidiasis. It is estimated 80-that 90% candidiasis vaginalis was caused by *C. Albicans*.¹ Prevalence of vaginal candidiasis in Indonesia estimated 25% -50%, bacterial vaginosis 20%-40% and trichomoniasis 5% -15%.²

C.albicans is a normal flora in some areas of the human body and an opportunistic pathogenic yeast. *C.albicans* can be a pathogen if there are predisposing factors, one of which is diabetes mellitus (DM). DM

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patients have a higher risk of developing candidiasis vaginalis. This is because high blood glucose levels cause elevated skin glucose levels in DM patients, thereby facilitating the appearance of skin manifestations in the form of dermatitis, bacterial infections and fungal infections. The increased blood levels in the blood and urine will make it easier for *C. albicans* infections to use blood glucose as a nutrient for growth.^{3,4}

Under normal conditions women has *C. Albicans* yeast on their bodies but are not aware because it is a harmless condition. One of the reasons why this *C. Albicans* can growth on the intimate part of a woman is because it contains glycogen which can support the life of fungi such as *C. Albicans*. The hormone estrogen is a hormone that is responsible against the appearance of *C. Albicans*. These hormones can trigger the vagina to produce more glycogen and support the growth of albicans candida fungi. This occurs because high levels of estrogen can affect vaginal susceptibility to infection by modulation of protective immune mechanisms such as decreased phagocytic cell activity such as neutrophils, macrophage cells and also natural killer (NK) cells.^{5,6}

This study was held to determine the association of diabetes mellitus and estrogen hormone levels with vaginal candidiasis.

Method

2 **Study design and research sample:** This research was quantitative which conducted by using a cross sectional comparative study was used on 2018 from women of childbearing age (20-35 years) and one-year oral contraceptive who came to the obstetric polyclinic who conducted visual inspection with acetic acid (VIA) in Bhayangkara Hospital Polyclinic, Padang Pasir and Nanggalo Primary Health Care Padang City, West Sumatera Province, Indonesia. We recruited 58 respondents with consecutive sampling technique.

11 **Operational definitions:** The variables of this study divided into two independent variables, that are diabetes mellitus and estrogen hormone levels; and a dependent variable, that is vaginal candidiasis.

8 **Ethics statement:** The study was approved by the ethical committee board of Faculty of Medicine Universitas Andalas, Padang City, Indonesia Number 493/KEP/FK/2017. Written informed consent was obtained from all respondents.

Data collection technique: Vaginal candidiasis was measured using *vaginal secretions and* microscopic laboratory test. Diabetes mellitus was measured using fast blood glucose and estrogen hormone levels measured with blood sample analysis using Enzyme-Linked Immunosorbent Assays (ELISA).

Da 2 **Analysis:** Chi-square test and independent sample T test were used to data analysis, P value < 0.05 was considered as statistically significant association. Data were processed using IBM SPSS Statistics 24.0.

Results

7 Data characteristics of the respondents (Table 1).

Table 1. Characteristics of the respondents

Characteristics	Vaginal candidiasis (n=29)	Not Vaginal candidiasis (n=29)
Age (Years), (mean±SD)	36.48 ± 5.89	36.34 ± 5.62
Weight (Kg), (mean±SD)	57.31 ± 6.14	58.41 ± 8.29
Education level, (f/%)		
Low	6 (20.6)	4 (13.7)
Moderate	18 (62.2)	22 (76.0)
High	5 (17.2)	3 (10.3)

The mean age of respondents with vaginal candidiasis were 36.48 ± 5.89 years and 36.34 ± 5.62 years with not vaginal candidiasis. Weight of respondents with vaginal candidiasis were 57.31 ± 6.14 Kg and 58.41 ± 8.29 Kg with not vaginal candidiasis. More than half of respondents have moderate level education between two groups.

Based on the results of examination of vaginal secretions in the laboratory can be seen the results of identification of *C. Albicans* (Figure 1).

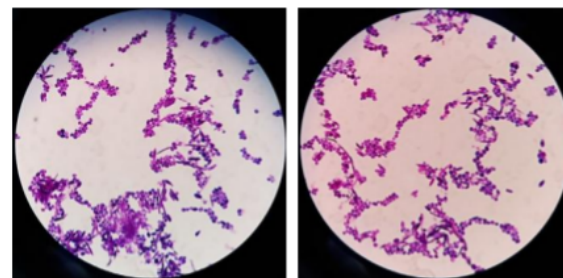


Figure 1. Identification of *C. Albicans*

Figure 1 showed *C. albicans* is dimorphic, producing yeast and pseudohifa.

The association of diabetes mellitus with vaginal candidiasis (Table 2).

Table 2. The association of diabetes mellitus with vaginal candidiasis

Diabetes mellitus	Vaginal candidiasis (f/%) (n=29)	Not vaginal candidiasis (f/%) (n=29)	Total	p-value
Diabetes mellitus	15 (51.7)	2 (6.9)	17 (29.3)	0.001
Not diabetes mellitus	14 (48.3)	27 (93.1)	41 (70.7)	
Total	29 (100.0)	29 (100.0)	58 (100.0)	

Table 2 known respondents with vaginal candidiasis from diabetes mellitus (51.7%) were slightly more than not diabetes mellitus (48.3%), diabetes mellitus was associated with vaginal candidiasis ($p < 0.05$).

Mean difference of estrogen hormone levels with vaginal candidiasis (Figure 2).

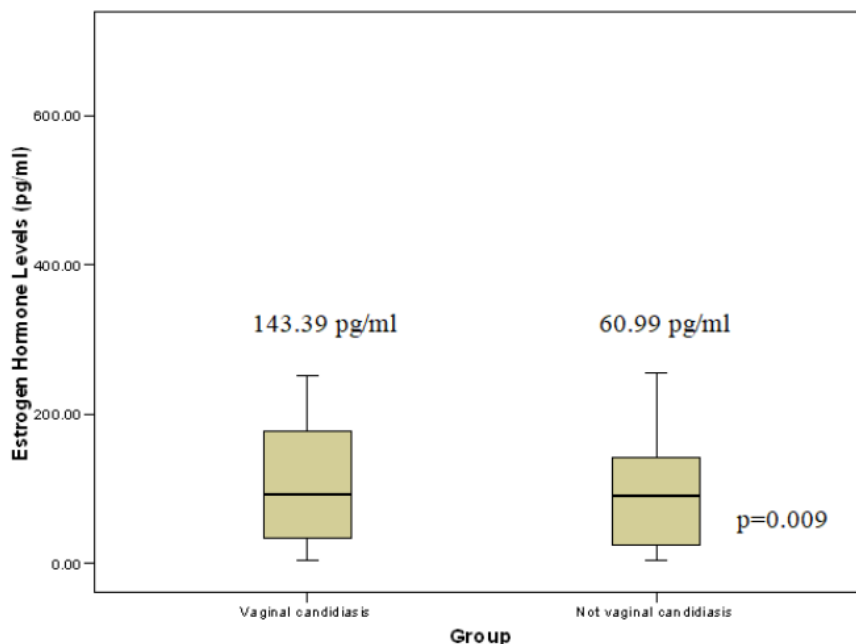


Figure 2. Mean difference of estrogen hormone levels with vaginal candidiasis

Figure 2 known there was statistically significant mean difference between estrogen hormone levels with vaginal candidiasis, estrogen hormone levels with vaginal candidiasis were 143.39 pg/ml higher than not vaginal candidiasis were 60.99 pg/ml.

Discussion

The results showed diabetes mellitus was associated with vaginal candidiasis ($p < 0.05$). There was statistically significant mean difference of estrogen hormone levels

with vaginal candidiasis, estrogen hormone levels with vaginal candidiasis were 143.39 pg/ml higher than not vaginal candidiasis were 60.99 pg/ml.

Previous study known diabetes mellitus was associated with occurrence of candidiasis vaginalis ($p < 0.05$).⁷ Another study known the frequency of *C. albicans* higher in diabetic patients compared to non-diabetes.⁸ Women with diabetes mellitus have a higher candidiasis vaginalis risk. This is because high

blood glucose levels cause elevated skin glucose levels in DM patients, thereby facilitating the appearance of skin manifestations in the form of dermatitis, bacterial infections and fungal infections. The increased blood levels in the blood and urine will make it easier for *C.albicans* infections to use blood glucose as a nutrient for growth. Candida colonization increases with increasing blood glucose levels. Hyperglycemia can also cause the movement of neutrophils and monocytes to be slower and the ability of phagocytes to decrease. This resulted in increased Candida colonization.^{3,4}

Increasing estrogen hormone levels can increase candidiasis vaginalis risk.⁹ Estrogen levels higher in women with candidiasis vaginalis were 120.15 pg/ml compared to without candidiasis vaginalis 90.5 pg/ml.¹⁰

One of the reasons why this *C. Albicans* can growth on the intimate part of a woman is because it contains glycogen which can support the life of fungi such as *C. Albicans*. The hormone estrogen is a hormone that is responsible against the appearance of *C. Albicans*. These hormones can trigger the vagina to produce more glycogen and support the growth of albicans candida fungi. This occurs because high levels of estrogen can affect vaginal susceptibility to infection by modulation of protective immune mechanisms such as decreased phagocytic cell activity such as neutrophils, macrophage cells and also natural killer (NK) cells. Increased estrogen levels cause the vaginal epithelium to thicken and its surface coated with glycoproteins. This high glycogen level in the vagina is a good source of carbon for Candida growth so that the Candida fungus can thrive and multiply into pathogens.^{5,6,11}

Conclusion

This analysis confirmed association of diabetes mellitus and estrogen hormone levels with vaginal candidiasis. The results of this study recommend the need to maintain blood glucose levels and use long-term contraception as well as the need for education and counseling.

4 **Conflict of Interest Statement:** The authors declared no potential conflicts of interest

Funding: Not applicable.

10 **Ethical Clearance:** The study was approved by the ethical committee board of Faculty of Medicine Universitas Andalas, Padang City, Indonesia Number

493/KEP/FK/2017. Written informed consent was obtained from all respondents.

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