

Original Article

## The Effect of Genital Hygiene Behaviors on Vulvovaginal Candida in Women with Type 2 Diabetes: A Multicenter Research

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### Abstract

**Objective:** Genital infections that occur mostly in women are called vulvovaginal candidiasis. The study was conducted to determine the effect of genital hygiene behaviors on vulvovaginal candida in women with type 2 diabetes.

**Methods:** Descriptive relational and the multi-centered study was conducted with 120 patients with type 2 diabetes who applied to the obstetrics and gynecology outpatient clinic of a public hospital in seven cities. The data were collected by using a questionnaire and the Genital Hygiene Behaviors Inventory. Frequency, arithmetic mean, standard deviation, minimum and maximum values, and Mann-Whitney U and Kruskal-Wallis tests were employed in the analysis of the data.

**Results:** In the study, 94.2% of women with Type 2 diabetes had various vaginal symptoms, 63.7% of them applied to an obstetrician due to vaginal symptoms and, 54.9% of them were diagnosed and treated for vaginal candidiasis. 36.2% of them did not apply to the obstetrician despite having some symptoms. Women had some wrong behaviors and insufficient information on sexual health and genital hygiene although no difference was found between Genital Hygiene Behaviors Inventory and vulvovaginal candida. However, a significant difference between Genital Hygiene Behaviors and the history of urinary tract ( $p=0.004$ ) and obstetric surgery or disease history ( $p=0.013$ ).

**Conclusions:** This study showed that diabetic women need to inform on genital hygiene behaviors as dimensions of diabetes education in order to prevent diabetes complications although no was found difference between genital hygiene behaviors and vulvovaginal candida.

**Key Words:** candidiasis, diabetes mellitus, genital hygiene, vulvovaginal, vulvovaginitis, Turkey

## Introduction

Diabetes is considered to be an important chronic disease due to its increasing incidence and comorbidities in the world (IDF, 2019). Genital infections are also seen in diabetic individuals as well as the most common health problems secondary to diabetes such as cardiovascular diseases stroke, kidney failure, retinopathy. Genital infections that occur mostly in women are called vulvovaginal candidiasis (VVC). Changes in the vaginal mucosa usually cause commensal opportunistic *Candida* organisms to acquire pathogenic features (Gonçalves et al. 2016). The uncontrolled diabetes mellitus is predisposing factor in addition to the risk factors such as pregnancy, hormone replacement treatments, immunosuppression, antibiotics, glucocorticoids and oral contraceptives (Brown et al., 2019; Ekuma, Ikenyi and Moses, 2019; Goncalves et al. 2016).

In studies on the subject, the incidence of VVC in women without diabetes was 11-23%, while it was found to be 32-67.5% in those with diabetes (Goswami et al. 2000; Goswami et al. 2006; Grigoriou et al. 2006). Vaginal candida colonization and the development of recurrent VVC are also higher in diabetic women (Gunther et al. 2014). High glucose level contributes to the development of VVC by disrupting the basic mechanisms of host defense and facilitating the adhesion of *Candida* to vaginal epithelial cells (Goncalves et al. 2016). It has been reported that the incidence and progression of genital infections can be significantly reduced with right and adequate perineal hygiene and right antifungal treatment (Kalra, Baruah, & Sahav, 2014).

Thus, patient education on perineal hygiene should be considered as a preventive measure for all diabetic patients regardless of antidiabetic treatment (Unnikrishnan et al., 2018).

Nurses take an active role in patient education in order to provide the necessary information to prevent the development of diabetes complications and to ensure the success of the treatment. However, vaginal infections can be partially ignored, while information is frequently provided about the known complications of diabetes and preventive measures. This may be related to the lack of literature on the frequency of vaginal infections and genital hygiene behaviors in diabetic patients. The study was

conducted to examine the effect of genital hygiene behaviors on the development of vulvovaginal candida in women with Type 2 diabetes and to contribute to the scientific knowledge on the subject in the nursing literature.

## Methods

**Study Design:** The study was designed as a descriptive relational and the multi-centered research.

**Study Setting and Study Population:** The study was performed in Izmir, Sakarya, Bolu, Corum, Kahramanmaras, Tunceli and Sanliurfa, cities of Turkey. Since Turkey is a country include seven geographical regions with different cultures and traditions a city was chosen from each region by the lottery process in order to obtain wide variety sample. Then, first two authors made contact with researchers that living in these cities and could support the study. The study was conducted between 15.09.2018 and 15.09.2019 in seven public hospitals.

Data was obtained from diabetic women who applied to the obstetrics and gynecology outpatient clinic of public hospitals in these cities by the researchers that living there. A total of 181 women with type 2 diabetes were reached in the study. However, 120 women who were over the age of 18, had diabetes for at least one year, had not entered menopause, and had an active sexual life constituted the sample of the study. Exclusion criteria were willing to participate in the study, who could not communicate verbally and who did not have diabetes were not included in the study.

**Procedures:** Research data has been collected between the dates of 15.09.2018 and 15.09.2019 in seven public hospitals in İzmir, Sakarya, Bolu, Corum, Kahramanmaras, Tunceli and Sanliurfa. Each interview was conducted with only one woman and the interviews lasted about 20-30 minutes.

**Data Collection Tools:** The questionnaire: Data were obtained by the researchers using a questionnaire created by based on the literature and included descriptive characteristics of participants such as age, educational status, marital status, smoking, using alcohol, urinary tract infections, type, duration and treatment of diabetes type, and presence of VVC symptoms. Genital Hygiene Behavior Inventory (GHBI): The Genital Hygiene Behavior Inventory (GHBI) was developed in 2005 by Ege and Eryilmaz. The

scale, is a type of Likert (1=Never, 2=Sometimes, 3=Often, 4=Always), consists of 27 items on general hygiene, menstrual hygiene, toilet hygiene and sexual hygiene practices. In the genital hygiene behaviors inventory, In the scale, the 17th, 26th and 27th items are scored in reverse. The total score of the scale ranges from 27-108 points and it is evaluated that the genital hygiene behaviors are at the desired level as the score gets higher. Cronbach's alpha coefficient of the original scale was 0.86 and it was 0.91 in the current study.

**Data Analysis:** The data were analyzed on a statistical program. Frequency and percentages were calculated for the categorical variables on descriptive characteristics of the students. The skewness and kurtosis tests were used to test whether age, and scale points were normally distributed. The data was analyzed with Wilcoxon signed ranks test or Spearman's rho Correlation Coefficient when the variables distribution was not normally. Significance level was accepted as  $p < 0.05$ .

**Ethics approval and informed consent:** The ethical approval was obtained from Hitit University Non-Interventional Research Ethics Committee (No: 2018-176). Also, written permissions were obtained from all hospital

managers. Written consent was obtained from the women participating in the study, using a patient information form. The participants were verbally and written informed about purpose of the study, data confidentiality and voluntary participation. The research was conducted under the Declaration of Helsinki. No payment was made to the participants for their participation in the research.

## Results

### Descriptive Characteristics

The mean of the participants' ages was  $38.8 \pm 7.9$ , 43.3% of them graduated from primary school, majority of them were married (88.3%) and 54.2% of them were moderate income. 51.7% of the participants had another chronic disease except from diabetes and 46.7% of them used to drug for their diseases. Half of them (51.7%) was used to OAD for diabetes treatment. The mean diabetes duration and HgA1c levels of women were sequentially  $6.1 \pm 4.9$  and  $6.7 \pm 1.1$ . 54.2% of the participants had urinary tract infection history, 15.8% had obstetrical surgery or diseases history, 37.5% had used a contraceptive method. More than half of them (56.7%) had information on genital infections in diabetes (Table 1).

**Table 1** Participants' descriptive characteristics

Descriptive Characteristics	$\bar{x} \pm SD$	Min-Max
Age	$38.8 \pm 7.9$	19-55 years
Diabetes Duration	$6.1 \pm 4.9$	1-21 years
HgA1c (n=78)	$6.7 \pm 1.1$	4.8-10%
Number of pregnancy	$2.9 \pm 2.6$	0-12
<b>Educational Level</b>	<b>n</b>	<b>%</b>
Illiterate or Literate	18	15.0
Primary school	52	43.3
High school	19	15.8
Bachelor or post-graduate	31	25.9
<b>Marital status</b>		
Married	106	88.3
Single	14	11.7
<b>Income status</b>		
Low	41	34.2
Moderate	65	54.2
High	14	11.6
Using Tobacco	29	24.2
Using Alcohol	11	9.2
Using antibiotics	43	35.8
Having another chronic disease	62	51.7
Using drug for another diseases	56	46.7
<b>Diabetes treatment</b>		
Oral antidiabetics (OAD)	62	51.7

Insulin	31	25.8
Diet treatment	17	14.2
OAD & Insulin	10	8.3
<b>Urinary tract infection history</b>	65	54.2
<b>Obstetrical Surgery or diseases history</b>	19	15.8
<b>Using a contraceptive method</b>	45	37.5
<b>Having information on genital infections in diabetes</b>	68	56.7
<b>Using a deodorant/an antiperspirant in genital area</b>	12	10.0
<b>Washing inside of vagina</b>	56	46.7

**Presence of Vaginal Symptoms and Vulvovaginal Candida:** 94.2% of women with Type 2 diabetes had various vaginal symptoms, 63.7% of them applied to an obstetrician due to

vaginal symptoms, 54.9% of them were diagnosed and treated for vulvovaginal candidiasis. The vaginal symptoms frequently experienced by Type 2 diabetic women participating in the study are shown in table 2 (Table 2).

**Table 2 Presence of vaginal candida and vaginal symptoms**

	<b>n</b>	<b>%</b>
<b>Having vaginal symptoms</b>	113	94.2
<b>Consulting to the an obstetrician</b>	72	63.7
<b>Diagnosed and treated for vulvovaginal candidiasis</b>	62	54.9
<b>No consult an obstetrician despite symptoms</b>	41	36.2
<b>No diagnosed for vulvovaginal candidiasis although consulting to an obstetrician because of vaginal symptoms</b>	10	8.8
<b>Vaginal Symptoms</b>	<b>Always/Often (n/%)</b>	<b>Never/Sometimes (n/%)</b>
Itching in the external genital area	84/73.3	36/36.7
Increased vaginal discharge	83/69.2	37/30.8
Vaginal itching sensation	81/67.5	39/32.5
Burning sensation in the external genital area	76/63.3	44/36.7
Cheese-like discharge	74/61.7	46/38.3
Malodorous discharge	72/60	48/40.0
Burning during or after sexual intercourse	69/57.5	51/42.5
Painful sexual intercourse	63/52.5	57/47.5
Painful urination/dysuria	61/50.9	59/49.1
Increased menstrual complaints	53/44.2	67/55.8
Discharge with yeasty odor	52/43.3	68/56.7
Rash on the external genital organs	47/39.2	73/60.8
Swelling in the external genital organs	23/19.2	97/80.8

In addition, although not shown in the table, when the descriptive characteristics of the women were compared with the development of vulvovaginal candidiasis, a significant difference was only found between the history of urinary tract infection ( $X^2=8.347$ ;  $p=0.004$ ) and history

of obstetrical surgery or diseases ( $X^2=6.332$ ;  $p=0.013$ ).

**Genital Hygiene Behaviors and Vulvovaginal Candida:** The mean of 10 items of the GHBI was above three. While women sometimes or always performed these genital hygiene

behaviors they performed the others sometimes 77.1±15.3 (Table 3). or often. The mean of total scale score was

**Table 3 The Mean of items and total scores of GHBI**

Items of GHBI	$\bar{X} \pm SD$
1. I attend training meetings held on issues concerning my sexual health.	1.7±0.8
2. I carefully monitor the sexual area in terms of signs of illness.	2.6±0.9
3. I follow the news about sexual health in the written and visual media.	2.4±1.0
4. I get information from health professionals about cleaning of sexual area.	2.1±1.0
5. I regularly go to the obstetrician.	2.4±0.9
6. I pay attention to the cleaning of sexual area.	3.4±0.8
7. I change my underwear (panties) every day.	3.4±0.8
8. I iron my underwear.	2.3±1.1
9. My underwear is made of cotton.	3.2±1.0
10. I use sanitary pad at menstrual period.	3.3±1.0
11. I take a shower in the menstrual period.	3.2±1.1
12. I would like to be used a condom in the case of malodorous discharge.	2.1±1.2
13. After cleanse my genital area with water, I dry with toilet paper.	3.4±1.0
14. I go to the obstetrician in the case of malodorous discharge.	2.9±1.0
15. I go to the obstetrician in the case of itching in the sexual area.	2.9±1.0
16. I go to the obstetrician in the case of pain or bleeding during sexual intercourse.	2.8±1.1
17. I use cloth at menstrual period.	2.6±1.3
18. I wash my hands before changing my sanitary pad.	2.9±1.1
19. After changing my sanitary pad I wash my hands.	3.6±0.8
20. I wash my hands before sexual intercourse.	2.6±1.2
21. I wash my hands after sexual intercourse.	3.4±0.9
22. I wash my sexual area before sexual intercourse.	2.9±1.2
23. I wash my sexual area after sexual intercourse.	3.6±0.8
24. I wash my hands before I go to the toilet.	2.7±1.2
25. I wash my hands after I go to the toilet.	3.7±0.7
26. I wash the genital area from front to back (from the vagina to the anus) in the toilet.	2.2±1.3
27. I always use the spacer cloth.	2.6±1.2
<b>Total IGHB points</b>	<b>77.2±15.3</b>

In addition, no statistically significant difference was found between the total scale score and vulvovaginal candidiasis ( $t=-0.811$ ;  $p=0.419$ )



## Discussion

VVC is a universal health problem affecting millions of women, especially diabetic individuals, and is caused by excessive growth of yeasts in the vaginal mucosa (Willems, Ahmed, Liu et al, 2020). Studies identified several risk factors favor the development of VVC, including reproductive age, pregnancy, hormone replacement therapy, antibiotic use, immunosuppression, uncontrolled diabetes, oral contraceptive pills, frequent sexual intercourse, and receptive oral sex (Yano, Sobel, Nyirjesy, et al., 2019).

However, there is not sufficient study about VVC and the relationship between genital hygiene behaviors in women with diabetes. Thus, current study aimed to determine the frequency of VVC and the relationship between genital hygiene behaviors in women with diabetes who applied to gynecology clinic. This sample was preferred in order to determine the frequency of individuals who received the certain diagnosis and treatment of VVC within this group. Nevertheless, there are some limitations regarding agents that cause VVC and HbA1c levels because of medical records the study determined that the majority of women with Type 2 diabetes (almost nine of 10 women) who participated in this study experienced a variety of symptoms associated with VVC.

Symptoms frequently experienced by participants were itching in the external genital area, increased vaginal discharge, vaginal itching sensation, burning sensation in the external genital area, cheese-like discharge and malodorous discharge as stated in the literature (Zeng, Zhang, Zhang, et al. 2018, Bignoumba, Onanga, Bivigou Mboumba, et al. 2019).

In addition, approximately six out of nine women applied to the obstetrician due to their existing complaints, and five of them received a diagnosis and treatment of VVC. Approximately 1/3 of that women, who had vaginal symptoms, did not never apply to an obstetrician or were not aware of the problem. Naturally, the presence of some symptoms does not confirm the diagnosis of VVC. However, all these findings show us the women with diabetes need to informed about vaginal symptoms. In connection with these findings, almost half of the women participating in the study had no information about genital infections in diabetes. Similarly, the mean

agreeing of women to the first item of the scale regarding participating in training meetings related to sexual health was also low.

Third and fourth items show that participants sometimes need to take information on sexual health from health professionals however they prefer much more written and visual media. When the other items of the scale were examined it had been thought that participants had lack of information about some genital hygiene behaviors such as using condom in the case of malodorous discharge and cleaning the genital area from front to back (from the vagina to the anus).

It can be said that women generally perform the behaviors in the scale sometimes or often. This result may be caused by cultural beliefs and religious practices as well as individual characteristics (Ekuma, Ikenyi ve Moses, 2019; Allison, Willems, Jayatilake, et al. 2016). Some Orthodox Jewish women perform ritual baths (mikveh) following their menstrual periods or after childbirth to become ritually pure, while the Muslim faith teaches a bathing ritual called full ablution (ghusl) for men and women as an act of purification after sexual intercourse or menstruation (Bahram, Hamid and Zohre, 2009; Hull, Hilber, Chersich, et al 2011).

In the study, no significant difference was between vulvovaginal candidiasis and descriptive characteristics and GHBI scores of women while a significant difference was found between the history of urinary tract infection and history of obstetrical surgery or diseases. This results were similar with some studies whereas different in others. For example, Zeng et al. (2018) found that there is no correlation between diabetes and candidiasis because of lack of data on diabetes mellitus. In another study, poor menstrual and vaginal hygiene practices were significantly correlated with bacterial vaginosis (Bahram, Hamid and Zohre, 2009). Carati ve ark. (2018) reported that no significant difference between positive vaginal candida culture and patient age, diabetes mellitus type, duration of diabetes mellitus, and genital hygiene (Carati ve ark., 2018).

In other studies on the subject, age, sexual activity (Loveless and Myint, 2017; Rodríguez-Cerdeira, Gregorio, Molaes-vila, et al. 2019), being married, and education level (Dou, Li, Zhou, et al. 2014), women who had 1-3 children,

using oral and injectable contraceptives, and treated with antibiotics for their candidiasis symptoms (Ekuma, Ikenyi ve Moses 2019), poorly controlled diabetes (Aggarwal, Wadhwa, Kapoor, et al. 2019, Nyirjesy, Zhao, Ways, and Usiskin, 2012.; Sobel, 2014; Konaté, et al. 2014) were found related with vaginal infections. Indeed, the glucose promotes adhesion of *Candida* to epithelial cells, stimulates its development and active expression of virulence factors. Hyperglycemia limits the ability of phagocytosis and elimination of the pathogen by neutrophils (Sobel, 2014).

Patients with diabetes are susceptible to infections (about four times more than non-diabetics), which might be ascribed to their abnormalities in immune function (Muller, Gorter, Hak, et al 2005). Similar to our study La Vignera et al. (2019) showed significant association between vaginal candidiasis with UTI which patients with diabetes (La Vignera, Condorelli, Cannarella, et al 2019; Irwin, Kopp, Agatep, et al 2011). UTI occur more frequently in diabetic patients because of reduced sensitivity and altered distensibility of the urinary bladder and glycosuria (Fu, Iglay, Qiu, et al 2014; He, Hu, Shi et al., 2018).

**Limitations:** There are some limitations to keep in mind when interpreting the study findings. Whether women had diabetes or not and their HBA1c levels were asked them since the diagnoses of the patients were generally recorded as vulvovaginitis according to the ICD code in the patient records. The type of infectious agent was also not recorded in detail in the patient's records. Thus, agents causing vaginal infection could not be considered in the study. The vaginal symptoms examined in the study are based on patient reporting.

**Conclusions:** In conclusion, diabetic women need to inform on genital hygiene behaviors as dimensions of diabetes education in order to prevent diabetes complications although no was found difference between genital hygiene behaviors and vulvovaginal candida. Since these behaviors cause urinary tract infections and urinary tract infections have also been associated with VVC.

In light of these results, Genital infections that occur mostly in women are called vulvovaginal candidiasis (VVC). High glucose level contributes to the development of VVC by

disrupting the basic mechanisms of host defense and facilitating the adhesion of *Candida* to vaginal epithelial cells. The results of the research point to the important role of Diabetic women need to inform on genital hygiene behaviors. The results of this research provide a basis since genital hygiene behaviors cause urinary tract infections and urinary tract infections have also been associated with VVC. Assessing the effect of genital hygiene behaviors on vulvovaginal candida in women with type 2 diabetes and the level of compliance with treatment by healthcare professionals, especially nurses, and providing education on this subject can be helpful in reducing the VVC, increasing treatment compliance.

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