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Original Article

Relationship between vaginal infections and gestational diabetes

Amjad Ahmadi (MSc) [1, 2]
Noushin Abdolmaleki (MSc) [3]
Daem Roshani (PhD) [4]
Fariba Farhadifar (MD) [1]
Rashid Ramazanzadeh (PhD) [5]
Sholeh Shahgheibi (MD) [6]
Mozhdeh Zarei (MSc) [7, 8]
Nadia Shakiba (MD) [9]
Bahram Nikkhoo (MD) [10*]

1. Social Determinants of Health Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran.
2. Department of Microbiology, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran.
3. Medical Laboratory, Besat Hospital, Kurdistan University of Medical Sciences, Sanandaj, Iran
4. Health Metrics and Evaluation Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran.
5. Department of Microbiology, Faculty of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran.
6. Department of Obstetrics and Gynecology, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran
7. Department of Health in Emergencies and Disasters, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
8. Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran
9. Department of Internal Medicine, Tohid Hospital, Kurdistan University of Medical Sciences, Sanandaj, Iran
10. Liver and Digestive Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran

*** Correspondence:**
Dr. Bahram Nikkhoo, Liver and Digestive Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran, 66177-13446, Sanandaj, Iran

E-mail:
microbiology90@gmail.com
Tel: +98 8733664674

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Abstract

Background: Gestational diabetes is defined as glucose intolerance with variable severity which starts or is first diagnosed during pregnancy. Globally on the rise, this health condition is one of the most common complications of pregnancy. Pregnant women with diabetes are at high risk of infection because high blood sugar levels provide food for many infections, including yeast, making it easier for the yeast to grow. This study aimed to examine the relationship between vaginal infections and gestational diabetes.

Methods: This study enrolled 300 pregnant women with gestational diabetes as the patient group and 300 pregnant women without gestational diabetes as the control group. The research tool in this study was a questionnaire and performing a warm and wet slide staining test on the vaginal swab sample.

Results: The mean age was 31.97±6.02 in the women with gestational diabetes and 30.98± 6.80 in the women without gestational diabetes. Smoking was zero in both groups. The frequency of vaginal infection was 34 (11.3%) in the patient group and 26(8.7%) in the control group. vaginal infections showed no significant association with gestational diabetes.

Conclusion: Despite its high prevalence, vaginal infections showed no significant association with gestational diabetes. Still, the high prevalence of infection in the two groups demands more attention from the healthcare system and obstetrician-gynecologists to check the infection before and after pregnancy.

Keywords: Gestational diabetes, Vaginal infection, Pregnancy, Iran.

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Gestational diabetes is defined as glucose intolerance with variable severity which starts or is first diagnosed during pregnancy (1). It also refers to conditions in which the blood glucose level increases during pregnancy and pregnant women with no prior diagnosis of diabetes show diabetes symptoms (2). This health condition is increasing worldwide and is one of the most common complications of pregnancy (3). The prevalence of gestational diabetes has been reported to be between 1 to 14 % in different communities (4). Gestational diabetes increases the probability of some complications in the mother and fetus during and after pregnancy, including preeclampsia, polyhydramnios, fetal macrosomia, complicated delivery, metabolic complications in the infant (hypoglycemia, hyperbilirubinemia, hypoglycemia, and hyponatremia), and perinatal mortality (5). In Iran, in a study conducted at the Research and Metabolism Center of Tehran University of Medical Sciences, the prevalence of gestational diabetes in Tehran was 4.7%. (6). Bacterial vaginosis is the most prevalent type of vaginitis during pregnancy, defined as an alteration in the bacterial flora of the vagina that results in the destruction of hydrogen peroxide-producing bacteria and the overgrowth of bacteria by overcoming anaerobic bacteria. In women with bacterial vaginosis, the concentration of anaerobic bacteria, *Gardnerella vaginalis*, and *Mycoplasma hominis* is 100 to 1000 times that of healthy women (7, 8).

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This disease is manifested in 10-35% of patients visiting the obstetrics-gynecology wards, 10-30% of those visiting the delivery ward, and 20-60% of those visiting the sexually transmitted diseases clinics. However, about 50% of affected women are asymptomatic (9, 10). In affected women, the risk of pelvic inflammation and vaginal cuff infections increases after hysterectomy and abnormal cytology; in pregnant women, it causes premature rupture of membranes (PROM) and early onset of labor pains (11). In a 2016 study, no relationship was found between vaginal infections and gestational diabetes (12). According to a 2004 study, there was a significant relationship between the increase in vaginal infections and gestational diabetes (13). However, a 1996 study showed no significant relationship between vaginal infections and diabetes in women (14). Given the contradictory results in the literature, the current study was designed to more precisely clarify the association between vaginal infections and gestational diabetes.

Methods

This case-control and observational study was conducted from 2017 to 2023. This study enrolled 300 pregnant women with gestational diabetes as the patient group and 300 pregnant women without gestational diabetes as the control group (All women participating in the study were symptomatic or asymptomatic in terms of clinical symptoms). The participants aged 19-40 years and expressed their consent to participate in this study. Written informed consents from subjects and/or their legal guardian(s) of study have been obtained. The research tool in this study was a questionnaire and performing a warm and wet slide staining test on the vaginal swab sample. The inclusion criteria for this study include (women with first pregnancy, gestational age 24 to 28 weeks). Exclusion criteria from this study included (obesity, diabetes mellitus, fatty liver, underlying diseases, thyroid disorders and kidney diseases). Also, the criteria for diagnosing gestational diabetes included fasting blood sugar >92 mg/dL and blood sugar >180 mg/dL one hour after eating 75 gr of sugar or blood sugar >153 mg/dL two hours after eating 75 gr. The results were checked by a gynecologist and after the confirmation of gestational diabetes by a specialist, these people were included in the study. Sampling of the vaginal part was done by a gynecologist at 24-28 weeks of pregnancy. The samples were collected in two centers, including the samples of patients in the diabetes center of Tawheed Hospital and the samples of control subjects in the pregnancy center of Besat Hospital's clinic. A questionnaire included age, level of education, occupation, smoking, alcohol use, history of vaginal infection, and a family history of diabetes. After completing the questionnaire and obtaining the consent form, two vaginal swab samples were taken from each person (one sample for warm staining on the slide and the second sample was placed in a glass tube containing physiological serum and some glucose to perform wet slide. Finally, the samples were examined with a light microscope to observe vaginal infections with warm staining and wet slide methods.

Data analysis: The data were entered into SPSS (Ver. 20) and summarized as tables and graphs showing percentages and means. Chi-square and Fisher's exact tests were performed to compare the qualitative variables between the two groups. A $p<0.05$ was considered statistically significant.

Results

The mean age was 31.97±6.02 in the women with gestational diabetes and 30.98±6.80 in the group without gestational diabetes. The highest level of education was high-school diploma, 88 (29.3%) individuals in the patient group and elementary school, 88 (29.3%) in the control group. Alcohol use was zero in both groups. Smoking was 1(0.3%) individual in the patient group, and 6 (2%) in the control group. There was no significant relationship between genital infections and gestational diabetes. The complete results are presented in table 1.

Table 1. Results of study data in the group of pregnant women with gestational diabetes and without gestational diabetes

Variables		Pregnant women with gestational diabetes n:300	Pregnant women without gestational diabetes n:300	P-value
Age		31.97±6.02	30.98±6.80	0.07
Education	**Illiterate**	21 (7%)	27 (9%)	0.76
	Elementary school	86 (28.7%)	88 (29.3%)	

Variables		Pregnant women with gestational diabetes n:300	Pregnant women without gestational diabetes n:300	P-value
	Middle school	83 (27.7%)	84 (28%)	
	High-school	88 (29.3%)	76 (25.3%)	
	University education	22 (7.3%)	25 (8.3%)	
Occupation	**University**	15 (5%)	12 (4%)	0.55
	Housekeeper	285 (95%)	288 (96%)	
Smoking		1 (0.3%)	6 (2%)	0.057
Alcohol consumer		0 (0%)	0 (0%)	-
History of diabetes in family members		81 (27%)	49 (16.3%)	0.002
History of genital infection		110 (36.7%)	116 (38.7%)	0.61
Gram-negative bacilli		9 (3 %)	8 (2.7%)	0.80
Gram-negative cocci		5 (1.7%)	5 (1.7%)	1.00
Candida albicans		65 (21.7%)	53 (17.7%)	0.21
Trichomonas vaginalis		34 (11.3%)	26 (8.7%)	0.27

Discussion

This study investigated the possible association between vaginal infections and gestational diabetes. Although no significant relationship was observed between these two variables, there was a significant relationship between a family history of diabetes and gestational diabetes ($p < 0.05$). There is less evidence for bacterial vaginosis in women with gestational diabetes. Furthermore, it appears reasonable for diabetic pregnant women to be more likely to have genital infections due to poor metabolic control, higher body mass index (BMI), and potential leukocyte function (15, 16). In addition, pregnancy itself is an immunodeficiency condition that increases the risk of vaginal *Candida* colonization (17).

On the other hand, some studies, including the present one, do not report any significant relationship between gestational diabetes and vaginal infections. Julian Marschalek et al. (2016) investigated diabetes in pregnant women and its relationship with vaginal infections. They selected 1253 women with diabetes and 7233 women without diabetes for their experiment; examining the vaginal swabs with the Gram staining method, they observed that the frequency of vaginal infection was 9% in women with and without diabetes; the frequency of *Candida* was 14% in women with diabetes and 13% in women without diabetes; and the frequency of *Trichomonas vaginalis* was zero in in women with diabetes and 1% in women without diabetes. Similar to our study, they found no relationship between diabetes and vaginal infection. Their results are consistent with the results of our study. Although in their study, diabetic people were used to enter the study, but in our study, people with gestational diabetes were included in the study and examined. (12). Nowakowska D. et al. (2004) examined the frequency of vaginal fungal infections in women with symptoms of gestational diabetes and diabetes mellitus. They included 132 women without symptoms of diabetes and 119 women with symptoms of both types of diabetes (47women with type 1 diabetes and 72 women with gestational diabetes). After the experiment, they observed that the frequency of fungal infection was 40.4% in women with type 1 diabetes, 22.2% in women with gestational diabetes, and 13.6% in women without gestational diabetes; as a result, contrary to our study, they observed a significant relationship between fungal infection and diabetes. This difference in the results can be attributed to the difference in the sample size and participants' characteristics (13). JM Piper et al. (1999) examined group B *Streptococcal* infection in 446 women with gestational diabetes and 1046 women without diabetes. They observed that the colonization rate of group B *Streptococcus* was 12% in women with gestational diabetes and 12% women without diabetes, and there was no

significant relationship between gestational diabetes and the colonization rate of group B *Streptococcus*. Although the results of this study were similar to ours, the type of infection diagnosed in their study differed from ours due to the natural colonization of group B *Streptococcus* in all women (18). Xinhong Zhang et al. (2018) examined the relationship between gestational diabetes and abnormal vaginal flora. They enrolled 186 pregnant women with symptoms of gestational diabetes and 200 pregnant women without gestational diabetes. They observed that the rate of vaginal infection was higher in patients with gestational diabetes compared to healthy pregnant women. Moreover, the amount of *Lactobacillus* and vaginal species differed between the two groups. In this study, unlike ours, there was a significant relationship between gestational diabetes and changes in vaginal bacteria, and this difference is probably due to their different research method (19).

Dalia Rafat et al. (2021) investigated changes in vaginal bacteria in gestational diabetes. In this prospective study, 502 pregnant women were recruited, and finally, 320 people, including 134 women with gestational diabetes and 186 women without gestational diabetes were evaluated. There was a significant relationship between vaginal dysbiosis, gestational diabetes, and adverse perinatal outcomes. There was also a significant difference in the infection status and its changes in the third trimester in relation to hyperglycemia. In this study, unlike ours, there was a significant association between gestational diabetes and changes in vaginal bacteria, which is probably due to the difference in the sample size (20). Although there was a significant relationship between gestational diabetes and a family history of diabetes in our study, there was no significant relationship between gestational diabetes and vaginal infections. Still, we observed a high prevalence of genital infections in both groups; thus, it appears that before and after pregnancy and when performing gestational diabetes tests, genital infections should be considered and tested by gynecologists and obstetricians.

One of the strong points of this study was its large sample size and examination of genital infections except for yeasts, but its limitations were the lack of diagnosis of infections by other methods such as culture and molecular, which is suggested in other studies from other diagnostic methods for detailed examination. Also, not conducting a cohort study in which the gestational diabetes of these people was controlled during pregnancy for re-sampling and determining the frequency of infection after diabetes control in them was another limitation. Despite the high prevalence of genital infections, there was no significant relationship between gestational diabetes and genital infections in the present study. Still, the high prevalence of infection in both groups demands more attention from the healthcare system and gynecologists and obstetricians to check the infection before and after pregnancy.

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Authors' contribution: AA, NA, FF: data curtain. DR, MZ: formal analysis. RR, SS, NS: investigation. BN: writing – original draft.All authors studied and approved the content of the present manuscript and participated in revising the paper.

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