

Microbiological pattern of laboratory confirmed vaginal infections among Saudi women

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Background: Imbalance in vaginal microbiota causes vaginal infection in women in mainly reproductive age. This study aimed to determine the microbiological and epidemiological profile of laboratory confirmed vaginal infections among Saudi women. **Methods:** This cross-sectional retrospective study involved medical records of Saudi women patients with laboratory confirmed vaginal infections from a private hospital in Riyadh, Saudi Arabia between January 2015 and January 2019. **Results:** Among the 4300 medical records that were reviewed, 564 (13.1%) had laboratory-confirmed vaginal infections. Data was collected about participant's personal and social data, medical history, primary presenting symptom, associated symptoms, obstetric and gynecological history, results of vaginal examination, the results of microbiological tests of vaginal swab specimens, and treatment given, using a data sheet. Sample collected were examined for bacterial vaginosis (BV), Vulvovaginal candidiasis (VVC), trichomonal vaginitis (TV), Group B Streptococcus (GBS) and other infections. Data was analyzed using SPSS version 21. VVC was the most common type (57.4%) followed by GBS (25%) and BV (12.1%). Vaginal infections were found to be associated with reproductive age group and high BMI. Most of the included patients did not have classic risk factors for vaginal infections. **Discussion:** The medical records of 564 patients, all with laboratory-confirmed vaginal infections were included in this study, which represents 13.1% of all patients who had attended the clinic during the study period. The mean age of the participants in this study was 40.97 ± 8.5 years.

Keywords

Bacterial vaginosis; Group B streptococci; Vaginal discharge; Vaginal infections; Vulvovaginal candidiasis

1. Introduction

Vaginal inflammation or vaginitis is caused by infectious or non-infectious factors [1]. BV, VVC and TV are the most common known causes of vaginitis [2]. Lactobacilli dominantly reside as non-pathogenic microbiota colonized in healthy vaginal tract of reproductive aged women, which helps in providing protection against pathogenic bacterial species [3]. Depletion of these lactobacilli consequently dis-

torts microbiota balance in vagina therefore increasing the concentration of anaerobic species, contributing to BV [4, 5]. BV is the infection which commonly shows no symptoms. It can be characterized by grayish white smelly discharge, fishy smell and an increased vaginal pH value of more than 4.5 [6–9]. Prevalence of BV ranges from 8–15% depending on geographical location, ethnicity and socio-economic status [10].

Candida albicans are fungi and an essential part of normal vaginal flora [11]. Its overgrowth mainly causes VVC, with characteristics vaginal pain, itching, discharge and swelling in vagina. Cottage cheese like discharge is typical characteristic of VVC [9]. Vulvular erythema and edema are its common signs. About 75% of women effected by VVC [12].

TV is the protozoan causing trichomoniasis, associated mainly with severe vaginitis in symptomatic women. Its estimated global incidence is 140.8 million [13]. It is a sexually transmitted infection, with frequent recurrence if male partner remains untreated. Trichomoniasis can cause a foul-smelling vaginal discharge, genital itching, and painful urination [14]. The vulva may be erythematous, edematous and excoriated, and subepithelial hemorrhages or “strawberry spots” may be observed on the vagina and cervix [9]. A previous study performed in Jeddah City; Saudi Arabia showed that the prevalence of trichomoniasis among women with vaginal discharge was 0.7% [15] while a similar study in Egypt found that prevalence of trichomoniasis amongst women with a vaginal discharge was 11% [16]. Amongst pregnant women, BV and VVC may lead to preterm birth [17, 18] while TV increases the risk of transmission of human immunodeficiency virus [19].

GBS is encapsulated Gram-positive cocci that are part of the microflora of the gastrointestinal tract and the genital tracts of pregnant and menopausal women, and women with predisposing medical conditions. Although, GBS colonization in the genital tract is generally asymptomatic, the multiplication of GBS in the vagina can lead to maternal morbid-

ity as well as neonatal morbidity and mortality during pregnancy [20]. In pregnant women, GBS colonization is associated with urinary tract infection, premature rupture of membranes, preterm labor, intrauterine fetal death, and complications such as chorioamnionitis and endometriosis [21]. The prevalence of GBS colonization during pregnancy is different with respect to the geographical variations, which has been reported to be approximately 20% to 25% in the United States and as high as 31.6% in Saudi Arabia [20]. The prevalence and risk factors associated with the infectious causes of vaginitis among reproductive-aged women in Saudi Arabia are still unclear. Therefore, the present study aimed to determine the prevalence and risk factors associated with the most common infectious causes of vaginitis among Saudi women.

2. Materials and methods

2.1 Study design

A descriptive cross-sectional retrospective study was conducted at a gynecology clinic in a private hospital in Riyadh City, Saudi Arabia between January 2015 and 2019. The study included women, who were suspected with asymptomatic and symptomatic vaginal infections during their prenatal visit to the gynecology clinic. Only Saudi patients with laboratory-confirmed vaginal infection were included in the study; whereas, ethnicity other than Saudi women and no laboratory evidence of vaginal infection were excluded. The data including women's age, last menstrual period, history of abortions, and presence of any clinical signs were obtained from the previous records. The study was approved by the institutional review board of Princess Nourah Bint Abdul Rahman University. Waiver of consent was obtained since identity of patients were not exposed either during data extraction or data analysis. Data sheet was used to collect participant's sociodemographic, behavioral characteristics and medical, reproductive, and sexual history information.

2.2 Sample collection

The records of 4300 patients were reviewed. Of these patients, 546 (13.1%) were found to have laboratory-confirmed vaginal infections and were included in the study. Information on participants was collected using a data extraction sheet. Questionnaire were used to collect participant's personal and social data, medical history, primary presenting symptom, associated symptoms, obstetric and gynecological history, results of vaginal examination, the results of microbiological tests of vaginal swab specimens, and treatment given. Standard sampling technique was followed to obtain the vaginal and cervical swab specimens as described by Onderdonk *et al.* [22]. The vaginal swabs obtained from each patient were placed into Amies transport medium to be transported to the lab. BV was diagnosed based on Amsel's criteria and Nugent score, VCC was diagnosed based on culture in symptomatic patients, while *T. vaginalis* was diagnosed based on wet mount examination of vaginal swab specimens [23, 24].

2.3 Data analysis

Descriptive statistics in terms of means, standard deviations, and interquartile ranges were performed using SPSS version 21.0 (SPSS Inc., Chicago, IL, USA) for Windows® to describe criteria of the studied sample. Associations between continuous variables were measured using analysis of variance (ANOVA) and for categorical variables chi-square test was performed. A p -values < 0.05 was considered statistically significant.

3. Results

The patients' age ranged from 21 to 64 years, with the mean of 40.97 ± 8.57 years, and their mean body mass index (BMI) was 27.3 ± 4.9 kg/m² (Table 1). Out of 564 women, 326 (57.4%) were positive for VVC, 140 (25%) were GBS, 68 (12%) had BV and 30 (5.3%) had other vaginal infections which include mixed infections. There was only one case of trichomoniasis. Majority of participants were employed (63%), married (93.1%), and had a regular menstrual cycle (89%). Forty-seven patients (8.3%) were pregnant, and patient parity ranged from 0–9 with the majority (74.1%) having 1–5 children. Almost half the participants (47.4%) were not using any method of contraception, and 38.9% were using oral contraceptives pills (Table 2).

Regarding the medical history of the patients, 5.9% were diabetics, 3% were smokers, 0.5% were using steroids, 2% were using antibiotics, while 1.6% were on immunosuppressive drugs (other than steroids). Participants' chronic medical conditions included polycystic ovaries (3.5%), hypothyroidism (2.7%), and hypertension (2.3%).

Regarding participants' obstetric and gynecological history, 37.6% had a history of vaginal infection, 16.1% had history of abortion, 1.2% had history of preterm labor, while 1.2% had sexually transmitted infections including chlamydia, syphilis and herpes simplex. Recorded obstetric and gynecological surgeries in patients were as follows: cesarean section (15.4%), hysterectomy (2.5%), salpingectomy (0.5%) and oophorectomy (0.4%). There was no association between the method of contraception and the type of vaginal infection. A statistically significant difference between the patients with different vaginal infections according to their reproductive age, parity was observed.

Fig. 1 displays the most common presenting complaints among patients with VVC and BV. Among participants with BV, the most common presenting complaint was a foul-smelling vaginal discharge (23.5%), and vulval itching (19.1%), while 20.6% of participants with BV were asymptomatic. Among participants with VCC, the most common presenting complaint was vulvar itching (34.4%), and a curd-like discharge (27.6%). Among participants with GBS, the most common presenting complaint was a curd-like discharge (23%), while 23% were asymptomatic. However, some patients presented with other complaints which may have been misleading in the clinical diagnosis.

Table 1. Participant's demographics and medical history.

Participant's characteristics		
Mean Age \pm SD, years		40.97 \pm 8.57
Mean BMI \pm SD, kg/m ²		27.3 \pm 4.9
BMI (kg/m ²)	<18.5	9 (1.15%)
	18.5–24.9	196 (34.8%)
	25.0–29.5	218 (38.7%)
	30.0–34.9	97 (17.2%)
	\leq 35	44 (7.8%)
Occupation	Employed	355 (63%)
	House wife	209 (37%)
	Diabetics	33 (5.9%)
	Smokers	17 (31%)
Medication history	On steroid user	3 (0.5%)
	On immunosuppressive other than steroids	9 (1.6%)
	On antibiotics	11 (2%)
History of abortion		91 (16.1%)
History of preterm labor		7 (1.2%)
History of previous attack of vaginal infection		212 (37.6%)
History of sexually transmitted disease		7 (1.2%)

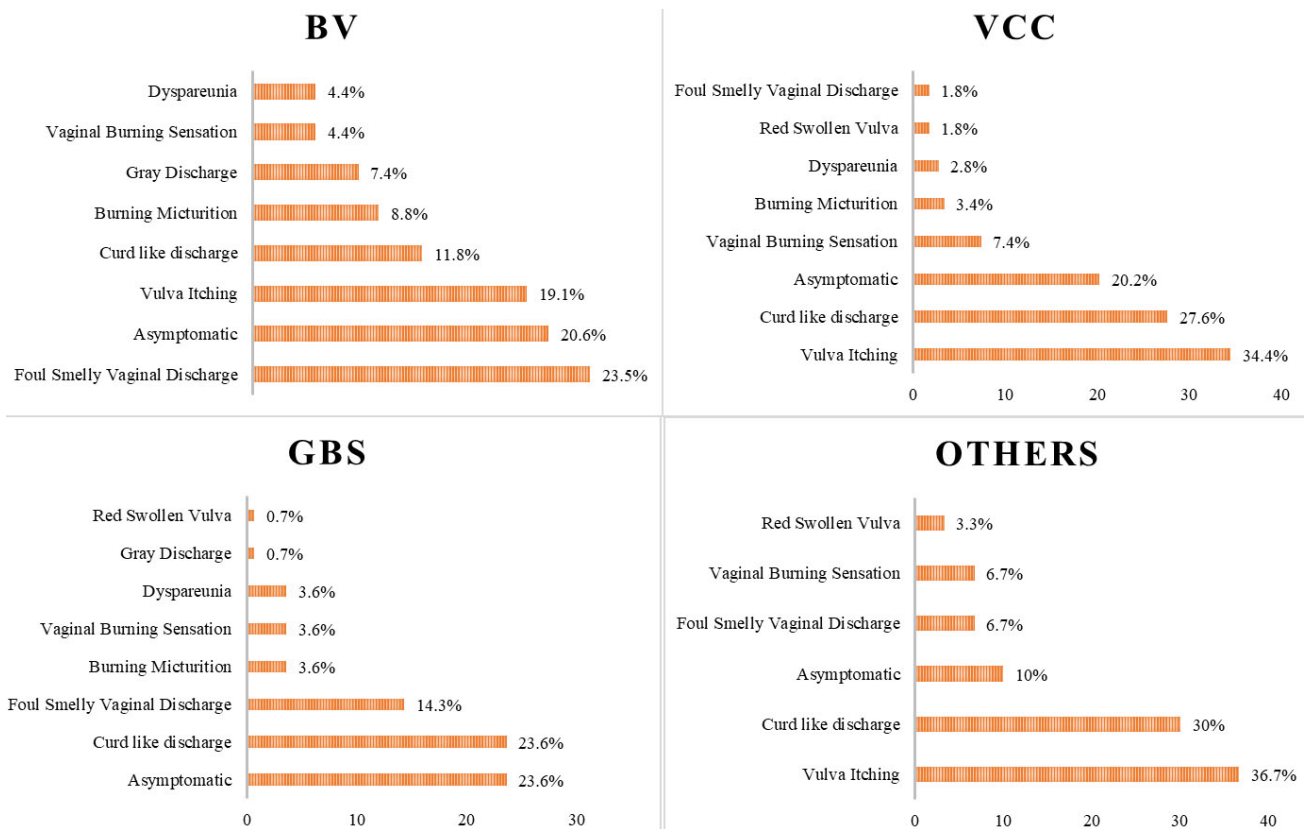


Fig. 1. Symptoms of patients with different vaginal infections.

4. Discussion

The medical records of 564 patients, all with laboratory-confirmed vaginal infections were included in this study,

which represents 13.1% of all patients who had attended the clinic during the study period. The mean age of the participants in this study (40.97 \pm 8.5 years) was higher than that

Table 2. Participants medical characteristics according to vaginal infection type.

	Total	BV	VVC	GBS	Others	p-value
Marital status						
Married	525 (93.1%)	63 (92.6%)	300 (92%)	132 (94.3%)	30 (100%)	0.37
Single	39 (6.9%)	5 (7.3%)	26 (7.9%)	8 (5.7%)	0 (0%)	
Chronic medical conditions						
Polycystic ovaries	20 (3.5%)	2 (2.9%)	15 (4.6%)	3 (2.1%)	0 (0.0%)	0.63
Hypothyroidism	15 (2.7%)	3 (4.4%)	5 (2.8%)	6 (4.3%)	1 (3.3%)	
Hypertension	13 (2.3%)	1 (1.5%)	9 (2.8%)	3 (2.1%)	0 (0.0%)	
Menstrual cycle						
Menstruating	502 (89%)	57 (83.8%)	301 (92.3%)	116 (82.9%)	28 (93.3%)	0.01**
Menopause	62 (11%)	11 (16.2%)	25 (7.7%)	24 (17.1%)	2 (6.7%)	
Pregnancy	47 (8.3%)	4 (5.9%)	33 (10.1%)	7 (5%)	3 (10%)	0.26
Parity						
0	74 (13.1%)	7 (10.3%)	60 (18.4%)	6 (4.3%)	1 (3.3%)	0.00034**
1–5	418 (74.1%)	49 (72.1%)	239 (73.3%)	107 (76.4%)	23 (76.7%)	
6–9	72 (12.7%)	12 (17.6%)	27 (8.3%)	27 (19.3%)	6 (20%)	
History of gynecological surgery						
None	458 (81.2%)	54 (79.4%)	270 (82.8%)	113 (80.7%)	21 (70%)	0.34
Hysterectomy	14 (2.5%)	2 (2.9%)	6 (1.8%)	5 (3.6%)	1 (3.3%)	
Oophorectomy	2 (0.4%)	0 (0%)	2 (0.6%)	0 (0%)	0 (0%)	
Salpingectomy	3 (0.5%)	0 (0%)	2 (0.6%)	1 (0.7%)	0 (0%)	
Cesarean section	87 (15.4%)	12 (17.6%)	46 (14.1%)	21 (15%)	8 (26.7%)	
Contraceptive method						
None	47.40%	51.50%	47.50%	50.70%	40%	0.25
Oral contraceptive pills	38.90%	39.70%	40.50%	35.70%	40%	
IUCD	9.2%	5.9%	8%	12.90%	13.30%	
Condom	2%	1.50%	2.50%	0%	6.70%	
Implanon	1.2%	1.50%	1.50%	0.7 %	0 %	

** Significant p-value.

reported in a study conducted in Egypt (29.47 ± 6.93 years) [24]. In accordance with the same study, there was a statistically significant association between BMI and the type of vaginal infection recorded in the current study [24]. There was no statistically significant difference between patients with different vaginal infections regarding the marital status or the employment. Another study by Al Quaiz JM *et al.* [25] also found no relationship between socioeconomic factors and vaginal infections.

In the present study, no association was observed between vaginal infections and diabetes, smoking, antibiotic use, and use of immunosuppressive drugs. In contrast, a previous study in Riyadh found that VVC was significantly more common in diabetic women than in non-diabetic women [26]. Moreover, a previous study in Germany [27] found that the use of systemic antibiotics was associated with a statistically significant increase in the risk of being diagnosed with VVC.

The mean age of patients in this study with GBS colonization (43.85 years) and those with BV (41.77 years) were higher than that of VVC (39.56 years). The patients with VVC are more likely to be younger than patients with BV and GBS. However, the difference was not statistically significant. This can be explained by the fact that decrease in the estrogen level in women near menopause, a change in

the vaginal flora takes place which allows the overgrowth of organisms associated with BV and GBS. BMI differs significantly according to the type of vaginal infection ($p = 0.02$), since patients with GBS are more likely to have a higher BMI than participants with other types of infection. This contrasts with other studies, which have found that VVC is more common in postmenopausal women [28]. There was no statistically significant difference in the marital status or the occupation between patients with different vaginal infections. In this study, most participants were not pregnant. A previous study in Saudi Arabia [26] showed that the prevalence of candidiasis increased during pregnancy.

Most of the participants in this study had 1 to 5 children with no statistically significant differences. Another study from Saudi Arabia found that there was a statistically significant increase in the prevalence of VVC as parity increased [9]. Vaginal infections may have adverse effects on pregnancy. In this study, few patients had a history of preterm labor or abortion. BV is more likely to be associated with history of abortion (25%) and preterm labor (2.9%) than other infections. This is explained by that BV is a risk factor for abortion and preterm labor. This is in contrast with a study performed in Nigeria [29] that found that women with a history of preterm labor had a statistically significantly increased risk of different

types of vaginal infections. In the present study only 2.9% of women with BV a history of preterm labor, while other studies up to 10.6% of women with BV have reported a history of preterm labor [29].

Most of the participants in present study had no STDs, which corresponds with the results of another study [24], in which most patients (98.8%) did not have STDs. A study from Rome [30] found that women with BV were more likely to have a history of STIs (12.9%) than women with VVC (1.5%).

In this study, the most commonly found complaint among women with BV was foul-smelling vaginal discharge (23.5%). This contrasts with another study [24], which found that the most common presenting complaint in women with BV was vulvar itching (60%). In our study, vulvar itching was the most common presenting complaint in women with VVC (34.4%) but it was less common than women with VVC in a study from the UK [31], in which 90% of women with VVC presented with vulva itching.

The present study showed no association between the method of contraception and the type of vaginal infection. These results are in line with a previous study which found no association between contraceptive use and the risk of vaginal infections [31]. In this study, it was found that women with BV were more likely to use oral contraceptive pills than women with other vaginal infections. A previous study has shown that using an IUCD, implants, and oral contraceptive pills are all associated with an increased risk of VVC [32]. Another study performed in Rome found that use of oral contraceptive and condom had a significantly protective effect in reducing the risk of BV [33].

In this study, women with GBS were most frequently treated with oral antibiotics (62.9%). The most used form of treatment of patients with BV was an oral antibiotic (45.6%), with antibiotic vaginal creams and vaginal suppositories being equally used (22.1% each) as alternative treatment options. In patients with VCC, the most common forms of treatment were antifungal vaginal cream (44.8%) and oral antifungal agents (38%). While, common treatment provided for other types of vaginal infections, which included one case of trichomoniasis and coinfections (VCC-GBS, VCC-BV and BV-GBS-VCC), was an antifungal vaginal cream (46.7%) with oral antibiotics being used less frequently (23.3%). A similar study from Saudi Arabia found that all cases of GBS were sensitive to penicillin [34]. However, in the present study, the most frequent form of treatment for VVC antifungal vaginal cream (44.8%), and the most frequent form of treatment for BV was oral antibiotics (45.6%). This was in accordance with a previous study performed in the USA [35].

5. Conclusions

VVC was the most common vaginal infection among women and vaginal infections were more likely associated with reproductive age group, multiparous and overweight women. However, the study recommends that the treatment of vaginal infections should be guided by the microbiological

diagnosis. More studies should be conducted to study the epidemiology of vaginal infections among Saudi women. Moreover, educational campaigns should be conducted to raise awareness about vaginal infections among women in the reproductive age group.

Author contributions

DSE Analyzed the data and designed the study, RashaA designed the study, HB wrote the manuscript and designed the study, RubaA Data collection, AA data Collection, SIA Data collection, RaghadaA Data Collection. All authors contributed to editorial changes in the manuscript. All authors reviewed and approved the final manuscript.

Ethics approval and consent to participate

The study was approved by the institutional review board of Princess Nourah Bint Abdul Rahman University (approval number: H-OI-R-059) and Dr. Sulaiman Al Habib Medical Group (approval number: H-OI-R-082). Waiver of consent was obtained since identity of patients were not exposed either during data extraction or data analysis.

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Conflict of interest

The authors declare no conflict of interest.

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