

Polyclinic Novakov & Assoc., Novi Sad¹
Health Center Novi Sad, Novi Sad²

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PREVALENCE OF VAGINAL INFECTIONS AND COMPLIANCE OF EMPIRICALLY PRESCRIBED THERAPY WITH THE RESULTS OF VAGINAL SWABS IN THE FEMALE POPULATION AT THE LEVEL OF PRIMARY HEALTH CARE

PREVALENCIJA VAGINALNIH INFEKCIJA I USKLAĐENOST EMPIRIJSKE TERAPIJE SA REZULTATIMA VAGINALNIH BRISEVA U POPULACIJI ŽENA NA NIVOU PRIMARNE ZDRAVSTVENE ZAŠTITE

Tanja MARJANOVIĆ MILOŠEVIĆ^{1,2}, Brigita LEPEŠ BINGOLD¹ and
Aleksandra NOVAKOV MIKIĆ¹

Summary

Introduction. Vaginal infections are the most common reason for gynecological exams. Due to the absence of national guidelines on screening and treatment, therapy is prescribed empirically. The aim of this study is to determine (1) the prevalence of vaginal infections in community practice setting, (2) infection prevalence across different groups, and (3) appropriateness of empirical therapy. **Material and Methods.** Results from 1770 vaginal swabs collected between June 2021 and June 2023 were classified into three groups: group 1 – young adult women (≤ 25 years), group 2 – women of reproductive age (26–45 years), group 3 – peri- and postmenopausal women (≥ 46 years). The study analyzed the population prevalence of vaginal infections, including bacterial vaginosis, vulvovaginal candidiasis, and pathogenic bacterial groups, as well as the appropriateness of the prescribed empirical therapy. **Results.** The prevalence of vaginal infection was 41.07%, with 24.07% of the population exhibiting symptomatic infections, and the remaining 17% having positive swab results subsequently. The population prevalence of bacterial vaginosis, vulvovaginal candidiasis, and pathogenic bacteria was 41.95%, 35.62% and 22.42%, respectively. The highest prevalence was observed in group 1, followed by group 3, and the lowest in group 2 (51.02%, 42.6%, 38.7%, respectively, $p=0.175$). The prevalence of bacterial vaginosis and vulvovaginal candidiasis in group 1 was 54.95%/45.04%, in group 2 was 53%/46.93%, and in group 3 was 57.69%/42.3% ($p=0.028$). Pathogenic bacteria isolation was highest in group 3 (49.4%) and lowest in group 1 (21.79%). Correction of empirical therapy was required in 36.55% of symptomatic women. **Conclusion.** Bacterial vaginosis and vulvovaginal candidiasis exhibit similar prevalence rates in groups 1 and 2, while pathogenic bacteria infections are most common group 3. When choosing therapy, it is important to consider patient age in relation to other predisposing factors associated with vaginal infections. **287 reči**

Key words: Vaginal Diseases; Vaginosis, Bacterial; Candidiasis, Vulvovaginal; Vaginal Smears; Treatment Outcome

Sažetak

Uvod. Vaginalne infekcije najčešći su razlog ginekološkog pregleda. Ne postoje nacionalne smernice za skrining i lečenje, te se terapija ordinira empirijski. Cilj rada je utvrđivanje (1) prevalencije infekcije populacije u primarnoj zdravstvenoj zaštiti, (2) prevalencije infekcije u formiranim grupama, (3) adekvatnost empirijski prepisane terapije. **Materijal i metode.** Rezultati 1.770 vaginalnih briseva (jun 2021–jun 2023), razvrstani su u grupe: Grupa 1 – mlade odrasle žene (≤ 25 god), Grupa 2 – žene reproduktivnog perioda (26–45 god), Grupa 3 – žene u perimenopauzi i postmenopauzi (≥ 46 god). Analizirana je prevalencija vaginalne infekcije populacije, bakterijske vaginoze, vulvovaginalne kandidijaze i patogenih bakterija formiranih grupa, te prepisana empirijska terapija. **Rezultati.** Prevalencija vaginalne infekcije je 41,07%, od čega je u 24,07% populacije registrovana simptomatska infekcija, a u preostalih 17% vaginalni bris je naknadno došao pozitivan. Prevalencija bakterijske vaginoze, vulvovaginalne kandidijaze i patogenih bakterija populacije je 41,95%, 35,62% i 22,42%. Najveća prevalencija infekcije je u Grupi 1, potom Grupi 3 a najmanja u Grupi 2 (51,02%, 42,6%, 38,7% respektivno, $p=0,175$). Zastupljenost bakterijske vaginoze i kandidijaze u Grupi 1 je 54,95%/45,04%; Grupi 2 53%/46,93%; Grupi 3 57,69%/42,3% ($p=0,028$) dok je izolacija patogenih bakterija najveća u Grupi 3 (49,4%), a najmanja u Grupi 1 (21,79%). Korigovanje empirijski date terapije bilo je potrebno kod 36,55% žena sa simptomima. **Zaključak.** Prevalencija bakterijske vaginoze i vulvovaginalne kandidijaze podjednaka je u grupama 1 i 2, dok je infekcija patogenim bakterijama najčešća vaginalna infekcija u Grupi 3. Pri odabiru terapije treba razmotriti godine usled povezanosti sa predisponirajućim faktorima.

Glavne reči: vaginalne infekcije; bakterijske vaginoze; vulvovaginalna kandidijaza; vaginalni bris; ishod lečenja

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Introduction

The primary complaint of women visiting gynecological offices is vaginal discharge [1, 2], with a

Abbreviations

VI	– vaginal infection
VS	– vaginal swab
BV	– bacterial vaginosis
VVC	– vulvovaginal candidiasis

symptomatic vaginal infection (VI) incidence up to 50% [3]. Typically, in symptomatic patients, empirical therapy is prescribed based on clinical presentation (vaginal malodor, increased secretion, itching) and physical examination findings (appearance of vaginal secretions, mucous membrane erythema, odor, vaginal pH) to alleviate or eliminate symptoms until vaginal swab (VS) results are available [3]. Several predisposing factors contribute to acquiring VI, including sexual behavior history (number of partners), vaginal douching, contraceptive use, antibiotic use, race, education level, and menstrual cycle [3–5]. Based on these criteria, we stratified the population into age groups to determine the prevalence and incidence of VI within each group and identify the dominant infectious agents in these groups.

Material and Methods

This retrospective observational study analyzed VS results and prescribed therapies extracted from medical records of patients examined by four gynecologists at the Polyclinic “Novakov & Assoc.” from June 2021 to June 2023. Included were cases where patients underwent examination and VS due to vaginal discharge syndrome, characterized by changes in amount or ap-

pearance of vaginal secretions, presence of itching and/or burning sensation, and appearance of unpleasant-smelling secretions. Additionally, cases where gynecological examinations were conducted for other indications (preventive examination, annual checkup, preparation for intervention/surgery) with vaginal secretions sampling were included. Data lacking information on swab results or prescribed therapy were excluded from analysis. A total of 1770 women were included and divided into three groups based on age and risk factors for vaginal infection: group 1 – young adult women (≤ 25 years) characterized by more frequent partner changes, contraceptive use, and self-medication; group 2 – women of reproductive age (26–45 years) characterized by monogamous relationships and cessation of contraception to achieve pregnancy; group 3 – perimenopausal/menopausal women (≥ 46 years) characterized by hormonal changes associated with declining estrogen levels leading to reduced glycogen in desquamated vaginal epithelial cells [6, 7]. Vaginal secretion samples were evaluated based on Nugent Gram stain score and cultivated for qualitative identification of specific organisms associated with bacterial vaginosis, pathogenic bacteria, and yeast.

Results

A total of 1770 women's medical records were analyzed from a primary women's healthcare setting. The average age of patients was 36 years, ranging from 17 to 86 years (**Table 1**). The prevalence of VI in the studied population was 41.07%, with

Table 1. Swab results according to specified patient groups**Tabela 1.** Rezultati briseva u formiranim grupama pacijentkinja

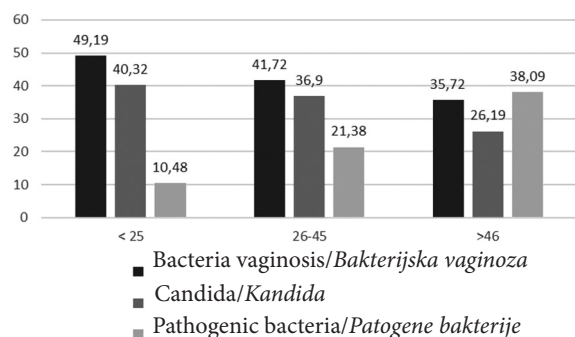
Swab result Rezultat brisa	Results distribution across specified patient groups Distribucija nalaza u formiranim grupama						Total Ukupno	
	Group 1/Grupa 1		Group 2/Grupa 2		Group 3/Grupa 3		N/Br.	%
	N/Br.	%	N/Br.	%	N/Br.	%		
Positive/Pozitivan	124	51.02	477	38.68	126	42.86	727	41.07
Negative/Negativan	119	48.97	756	61.31	168	57.14	1043	58.93
Total/Ukupno	243 (13.73%)		1233 (69.66%)		294 (16.61%)		1770	100%

Legend: group 1 – young adult women (≤ 25 years); group 2 – women of reproductive age (26–45 years); group 3 – perimenopausal/menopausal women (≥ 46 years)/Legenda: grupa 1 – mlade odrasle žene (≤ 25 god); grupa 2 – žene reproduktivnog perioda (26–45 god); grupa 3 – žene u peri- i postmenopauzi (≥ 46 god)

Table 2. Pathogen prevalence across age groups**Tabela 2.** Prevalencija uzročnika infekcija po starosnim grupama

	Bacterial vaginosis Bakterijska vaginoza		Candida Kandida		Pathogenic bacteria Patogene bakterije		Total Ukupno
	N/Br.	%	N/Br.	%	N/Br.	%	N/Br.
Group 1/Grupa 1	61	49.19%	50	40.32%	17	10.48%	124
Group 2/Grupa 2	199	41.72%	176	36.9%	115	21.38%	477
Group 3/Grupa 3	45	35.72%	33	26.19%	44	38.09%	126
Total/Ukupno	305	41.95%	259	35.62%	163	22.42%	727

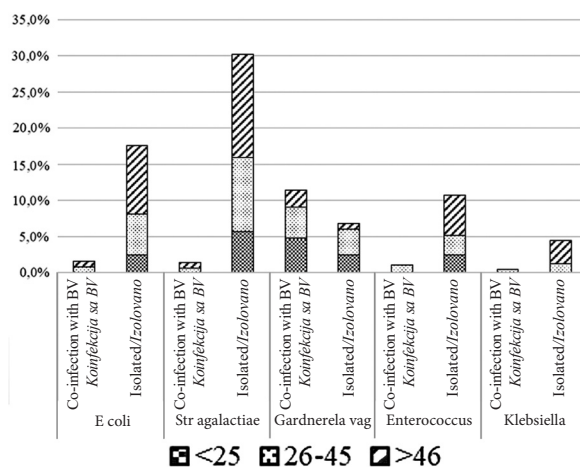
Legend: group 1 – young adult women (≤ 25 years); group 2 – women of reproductive age (26–45 years); group 3 – perimenopausal/menopausal women (≥ 46 years)/Legenda: grupa 1 – mlade odrasle žene (≤ 25 god); grupa 2 – žene reproduktivnog perioda (26–45 god); grupa 3 – žene u peri- i postmenopauzi (≥ 46 god)



Graph 1. Prevalence of infection pathogen across age groups

Grafikon 1. Prevalencija uzročnika infekcija po starosnim grupama

symptomatic VI occurring in 24.07% of cases. Bacterial vaginosis (41.95%) was the most common VI, followed by vulvovaginal candidiasis (35.62%) and isolated pathogenic bacterial flora (22.42%). Concurrent bacterial vaginosis (BV) with predominant pathogenic bacteria was observed in 14.75% of cases (**Table 2**). Among the age-stratified groups, IV prevalence was highest in young adult women (51.02%), followed by perimenopausal/menopausal women (42.86%), and lowest in women of the reproductive age (38.68%) (**Table 2**). The distribution of infectious agents within these groups showed equal prevalence of bacterial vaginosis and candidiasis in young adult women and women of the reproductive



Graph 2. Distribution of pathogen agent across age groups

Grafikon 2. Distribucija izolovanih patogenih uzročnika po grupama

age (49.19% vs. 41.71% in group 1; 10.3% vs. 36.9% in group 2; $p=0.028$, **Graph 1**). In perimenopausal/menopausal women, a dominance of bacterial over candida VI was observed (57.69% vs. 42.3%, $p=0.0712$), with a decrease in nonspecific BV and an increase in isolated pathogenic bacterial infections (50.56% vs. 49.43%, $p=0.107$, **Table 3**), as demonstrated graphically in **Graph 2**. Empirical therapy was prescribed in 45.47% of cases during examination. Among confirmed infections (41.07% of cases),

Table 3. Distribution of isolated pathogen bacteria across the specified groups

Tabela 3. Distribucija izolovanih patogenih bakterija po grupama

		Group 1/Grupa 1 (N/Br. = 124)	Group 2/Grupa 2 (N/Br. = 477)	Group 3/Grupa 3 (N/Br. = 126)	Total/Ukupno (N/Br. = 727)
E coli	Co-infection with BV Koinfekcija sa BV	0	4 (0.8%)	1 (0.8%)	5 (0.69%)
	Isolated/Izolovano	3 (2.4%)	27 (5.7%)	12 (9.5%)	42 (5.48%)
Streptococcus agalactiae	Co-infection with BV Koinfekcija sa BV	0	3 (0.6%)	1 (0.8%)	4 (0.55%)
	Isolated/Izolovano	7 (5.6%)	49 (10.3%)	18 (14.3%)	74 (10.18%)
Gardnerella vaginalis	Co-infection with BV Koinfekcija sa BV	6 (4.8%)	20 (4.2%)	3 (2.4%)	29 (3.99%)
	Isolated/Izolovano	3 (2.4%)	17 (3.6%)	1 (0.8%)	21 (2.89%)
Enterococcus	Co-infection with BV Koinfekcija sa BV	0	5 (1.0%)	0	5 (0.69%)
	Isolated/Izolovano	3 (2.4%)	13 (2.7%)	7 (5.6%)	23 (3.16%)
Klebsiella	Co-infection with BV Koinfekcija sa BV	0	2 (0.4%)	0	2 (0.27%)
	Isolated/Izolovano	0	6 (1.3%)	4 (3.2%)	10 (1.37%)

Legend: group 1 – young adult women (≤ 25 years); group 2 – women of reproductive age (26-45 years); group 3 – perimenopausal/menopausal women (≥ 46 years); BV – bacterial vaginitis/Legenda: grupa 1 – mlade odrasle žene (≤ 25 god); grupa 2 – žene reproduktivnog perioda (26-45 god); grupa 3 – žene u peri- i postmenopauzi (≥ 46 god); BV – bakterijski vaginitis

therapy required correction based on test results in 36.55% of cases, while therapy remained unchanged in 63.46% of cases. Notably, 5.4% of cases received therapy based on symptomatic presentation, despite negative vaginal sample results for infection.

Discussion

Vaginitis is a highly prevalent condition [5, 7–10] and represents the most common complaint among patients in women's healthcare settings [3, 11]. Discrepancies in guidelines [12–14], both internationally and due to the absence of national guidelines, contribute to significant variations in testing, treatment, and follow up recommendations. Currently, effective screening for BV is not routinely performed, suggesting a likely difference between actual and reported prevalence of BV [3]. The objective of this study was to investigate the prevalence of VI in general, unselected population, encompassing all women who visited out community practice setting during the study period. Published data BV prevalence range widely, from 20% to 60% [3, 8–10, 15], reflecting cultural factors [3] and variations among observed populations [8, 9, 15]. In our cohort, the frequency of symptomatic VI was 24.07%, while 17% of asymptomatic women who attended for routine or other gynecological reasons tested positive on smear tests, raising the prevalence to 41.07%. In essence, 4 out of 10 women undergoing gynecological examination were found to have some form of VI, whether symptomatic or asymptomatic. A noteworthy concern is the significant number of patients who self-diagnose and self-medicate, seeking professional consultation only after unsuccessful attempts to alleviate symptoms. This issue is particularly evident in vulvovaginal candidiasis (VVC), for which highly effective over-the-counter therapies are available, rapidly relieving the symptoms of uncomplicated infections, albeit without ensuring complete resolution [8, 10, 15]. For these reasons, it is quite certain that the incidence of VIs, including bacterial and vulvovaginal candidiasis VVC, is underestimated. The observed trend of IV incidence and prevalence being highest among young adult women aligns with the existing literature [2, 5, 6]. However, the notable increase in infections, particularly symptomatic cases, during the perimenopause/menopause phase is intriguing. Evidence underscores the significant impact of estrogen – specially its decline – in predisposing individuals to infection, highlighting the necessity to tailor therapy accordingly [6, 16]. The accuracy of empirically administered therapy is of paramount importance. Therefore, we analyzed the percentage of cases requiring therapy adjustment following receipt of vaginal swab (VS) results obtained during the visit, based on current treatment guidelines from the Center for Disease Control and Prevention (CDC) of the United States [12]. In 36.55% of cases, therapy correction was required, whereas in 63.46%, the therapy remained unchanged. It is important to note

that medication was prescribed only in cases where symptoms or physical examination strongly indicated infection presence. A study conducted by the University of Pittsburgh on symptomatic vaginal infections found that therapy was prescribed in 34% of cases based on symptoms and a rapid on-site testing, despite subsequent negative smear results [8]. This “unnecessary” empirical therapy based on symptoms correlates with a higher rate of re-examination within 90 days compared to those not receiving therapy [8]. Our analysis revealed that in 5.4% of cases, therapy was prescribed due to suspected infection symptoms, yet the subsequent swab was negative. Furthermore, the issue of asymptomatic infections and the lack of treatment for transitional flora are crucial considerations. Using the Nugent score system a “gold standard” for diagnosing VIs to classify women in the intermediate group prompts the question of treatment necessity [8, 12, 17]. Given the high rate of vaginal infections (4 out of 10 women), the associated risks (such as increased susceptibility to human immunodeficiency virus, *Neisseria gonorrhea*, *Chlamydia trachomatis*, *Trichomonas vaginalis*, Herpes simplex virus type 2, pelvic inflammatory disease, intrauterine infection and premature birth [3, 6, 8, 10]), and relatively common inadequate treatment practices (self-medication, need for therapy correction in one third of cases), leads to the conclusion that addressing asymptomatic VIs or those classified in the intermediate group according to the Nugent score could mitigate the consequences of VI [3]. Recurrent BV may stem from reinfection (endogenous or from a partner) or relapse [3]. Dominant bacterial types (such as *Atopobium vaginae*, *Gardnerella vaginalis*), co-infection, and bacterial load are key factors contributing to bacterial vaginosis recurrence [10, 11, 18]. In the observed population, 14.75% of cases exhibited an intermediate or definitive BV (Nugent score ≥ 4) with dominance prevalence of pathogenic bacteria. Notably, specific pathogen isolation, with or without BV, defined as unspecific bacterial infection in test reports, was more pronounced among older patients (10.48% in young adult women vs. 38.09% in perimenopausal/menopausal women). This age-related trend likely stems from declining estrogen levels in this group [6, 16], supporting the assertion that age is a pivotal factor in empirically prescribing treatment.

Conclusion

The prevalence of unspecific bacterial infections, namely bacterial vaginosis and vulvovaginal candidiasis, is consistent across both the general population and in the defined age groups, with a notable increase in infection rates caused by isolated pathogenic bacteria among perimenopausal/menopausal women. When determining the appropriate therapy, in addition to considering the smear results, the patient's age should be taken into account due to its association with other predisposing factors.

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