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REVIEW ARTICLE OPEN ACCESS

Vulvovaginal Candidiasis in Pregnancy: Pathogenesis, Diagnostic Advances, Therapeutic Strategies, and the Role of Probiotics

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Abstract

Vulvovaginal candidiasis (VVC) is a common fungal infection, mostly caused by *Candida albicans*, that affects many pregnant women. The increased susceptibility of pregnant woman is related to hormonal changes, and decrease in cell-mediated immunity, and disturbed vaginal microbiota. If left untreated, VVC may lead to negative effects for both the mother and the fetus, including low birth weight, neonatal candidiasis, and premature labor. This review explores the pathogenesis, diagnostic advancements, treatment approaches and the role of probiotics managing VVC during pregnancy. The clinical presentation of VVC include pruritus, burning, leucorrhoea and dysuria, but asymptomatic colonization is also frequent. The proper diagnosis is important and is usually made by a clinical evaluation, along with laboratory testing including KOH microscopy, culture, and germ tube testing. Advanced diagnostic tools, such as rapid card tests and molecular methods like PCR, LAMP, and MALDI-TOF MS enhance pace and accuracy of diagnosis. Topical azoles, especially clotrimazole are preferred as first line in view of their safety in pregnancy. Systemic agents such as fluconazole are used cautiously depending on the gestational age and the severity of the presentation. Probiotic treatment with *Lactobacillus* may serve as an adjunctive antifungal therapy and may contribute to the restoration of vaginal microbiota, as well as a shortage of recurrence particularly in recurrent VVC in women. This review emphasizes the need for early diagnosis and multimodal management including anti-fungals and probiotics in order to achieve the best maternal and neonatal outcome. Further research is warranted to establish standardized guidelines for probiotic use during pregnancy in VVC management.

Keywords: Vulvovaginal Candidiasis, Pregnancy, *Candida albicans*, Pathogenesis, Diagnosis, Antifungal Therapy, Probiotics, Antifungal Resistance

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INTRODUCTION

Candida albicans primarily causes vulvovaginal candidiasis (VVC), a fungal infection of the vulva and vagina; however, other species of *Candida* may also play a role. Symptoms of this illness include burning, itching, redness, swelling, and a thick, white discharge from the vagina.[1] Until now, it is estimated that at least 70% of women will experience at least one episode of VVC in their lifetime.[2] VVC is a common issue during pregnancy because of the physiological and immunological changes that it brings about, which increase its vulnerability.[3,4] VVC often manifests as pruritus, a burning feeling, vaginal discharge, dyspareunia, dysuria, vulva and vaginal edema, and redness.[4,5]

Women of childbearing age are susceptible to vaginal candidiasis, which affects them frequently, at least one episode occurs in the lives of these women.[6,7] According to researchers, the occurrence of vaginal candidiasis is linked to the number of gestations and trimesters. Researchers found that women in their third trimester and multigravida had the highest incidence rates of Candidiasis.[8] We can divide VVC instances into two categories, simple and complex.[9] Patients with uncomplicated VVC, which is often caused by *Candida albicans* and affects healthy, non-pregnant women, may benefit from short-course antifungal medications. It manifests as intermittent bouts of mild-to-moderate severity. Alternatively, non-albicans *Candida* (NAC) species produce complex VVC, which is more common in women with immunodeficiency, diabetes, pregnancy, and other medical disorders. It can appear severe or recurring, and short-term antifungal medications make it difficult to treat.[9,10]

Numerous risk factors, including pregnancy, immunosuppression, HIV infection, diabetes, the use of contraceptives, and antibiotics, increase one's susceptibility to VVC.[11] Several pregnancy-related factors, such as higher estrogen levels, more glycogen production by the vaginal mucosa, and lower cell-mediated immunity, may also increase the risk of VVC during pregnancy and allow the bacteria to settle without any symptoms.[11,12] Studies show that between 10 and 20 percent of pregnant women have VVC, which is a very prevalent condition during pregnancy.[13] In addition to being uncomfortable, untreated VVC during pregnancy might result in serious side effects. Preterm labor, low birth weight, and neonatal candidiasis are a few possible problems. In order to protect the mother's health as well as the health and well-being of the fetus, prompt and efficient VVC therapy is essential.[14] Despite its high frequency and potential problems, VVC management in pregnant women presents distinct challenges. The safety of antifungal medications during pregnancy is of significant concern, necessitating a careful balance between effectiveness and possible hazards to the growing baby.[15] Furthermore, recurrent VVC, defined as four or more episodes per year, creates additional therapeutic challenges and demands a thorough knowledge of the underlying pathophysiology and risk factors.[16]

Vaginal Candidiasis is the most common disease in pregnant women all over the world. The risk of carriage to develop disease in pregnant women is two times higher than non-pregnant women particularly during the third trimester due to changes in the levels of reproductive hormones and deposition of glycogen in the vagina.[17,18] VVC affects a considerable proportion of women worldwide, with up to 70%-75% experiencing it at some point in their lives. The prevalence among pregnant women is higher due to hormonal and physiological changes during pregnancy.[19] VVC mainly affects women of childbearing age, predominantly between 20 and 40 years of age.[20-23] A study in the Ho municipality reported a VVC prevalence of 40.1% among pregnant women. The study identified *Candida albicans* as the most frequently isolated species, accounting for 65.2% of the cases.[24] The prevalence of Vulvovaginal candidosis (VVC) in pregnant women has been extensively studied globally. Studies have reported varying prevalence rates, with percentages ranging from 29.2% in Africa to as high as 90.38% in Asian countries like Kenya.[25,26] Study from Spain reported 28% prevalence of *Candida* species among pregnant women. Of these, *Candida albicans* was the major isolate 90.4% followed by *Candida glabrata* 6.3%. Most studies reported *Candida albicans* as the most predominant cause of vaginal *Candidiasis* in pregnant women which accounts 80%-95% of *Candida* infection.[27-31]

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diabetes, the use of contraceptives, and antibiotics, increase one's susceptibility to VVC.[11] Several pregnancy-related factors, such as higher estrogen levels, more glycogen production by the vaginal mucosa, and lower cell-mediated immunity, may also increase the risk of VVC during pregnancy and allow the bacteria to settle without any symptoms.[11,12] Studies show that between 10 and 20 percent of pregnant women have VVC, which is a very prevalent condition during pregnancy.[13] In addition to being uncomfortable, untreated VVC during pregnancy might result in serious side effects. Preterm labor, low birth weight, and neonatal candidiasis are a few possible problems. In order to protect the mother's health as well as the health and well-being of the fetus, prompt and efficient VVC therapy is essential.[14]

Despite its high frequency and potential problems, VVC management in pregnant women presents distinct challenges. The safety of antifungal medications during pregnancy is of significant concern, necessitating a careful balance between effectiveness and possible hazards to the growing baby.[15] Furthermore, recurrent VVC, defined as four or more episodes per year, creates additional therapeutic challenges and demands a thorough knowledge of the underlying pathophysiology and risk factors.[16]

A study conducted at the Garoua Regional Hospital revealed a prevalence of 27.8% among pregnant women, with *Candida albicans* being the predominant species, representing 73% of the isolates and A study in Hyderabad found a prevalence of 26% among pregnant women attending antenatal clinics, with *Candida albicans* being the most common pathogen.[32] In Oyo State, a study reported a VVC prevalence of 17.3% among pregnant women, indicating significant regional differences within Africa.[33] A cohort study involving 3,965 pregnant women found that 10.5% experienced VVC during pregnancy. The prevalence was higher in the second trimester (6.8%) compared to the first (4.3%) and third trimesters (5.0%).[34] Additionally, the prevalence of VVC during pregnancy has been found to differ based on geographical regions, with higher rates observed in less-developed countries.[35-37] These findings highlight the significant burden of VVC among pregnant women worldwide, emphasizing the importance of appropriate identification techniques and larger sample sizes to accurately estimate the occurrence of VVC in this population group.

This review provides a comprehensive overview of vulvovaginal candidiasis during pregnancy, focusing on its pathogenesis, recent diagnostic advances, therapeutic strategies, and the emerging role of probiotics. It also highlights current evidence, existing knowledge gaps, and future research directions to improve maternal and fetal outcomes.

Clinical presentation of vulvovaginal Candidiasis in pregnant women

The pregnant woman typically presents with vulvar itching, burning sensation of the vulva, thick curd like white vaginal discharge, redness (erythema) of the vulva, swelling (edema), painful urination (dysuria), and painful sex (dyspareunia).[36,37] On the other hand, it is common for a pregnant woman to have an asymptomatic vaginal *Candida* infection.[38-40] This makes diagnosis by laboratory testing such as microscopic examination, culturing and/or molecular testing necessary prior to initiating therapy because of the overlapping symptomatology with bacterial vaginosis and Trichomonas vaginalis.[41-43]

Healthcare practitioners who are aware of VVC's clinical presentation ensure better maternal and newborn outcomes. Therefore, if a pregnant woman has any VVC symptoms, she should consult with her healthcare provider to ensure an appropriate diagnosis and treatment plan.

Pathogenesis

The pathogenesis of VVC during pregnancy is multifactorial, involving complex interactions between *Candida* virulence factors, hormonal changes, alterations in the vaginal microbiota, and modulation of the maternal immune response. Although *Candida* species normally exist as commensals in the vaginal tract, pregnancy-related hormonal and immunological changes, along with risk factors such as broad-spectrum antibiotic use, chronic corticosteroid therapy, diabetes mellitus, HIV infection, oral contraceptive use, contraceptive devices, and organ transplantation, can disrupt the normal vaginal environment and host defenses. These changes promote the transition of *Candida*

from asymptomatic colonization to symptomatic infection.[44-46]

Estrogen and progesterone levels are higher during pregnancy. Increased estrogen levels during pregnancy cause *Candida* species to adhere more strongly to vaginal epithelial cells and increase glycogen content in vaginal tissue, resulting in immune suppression. This creates a favorable environment for *Candida's* growth.[47-49] Elevated progesterone levels during pregnancy may also change the vaginal microbiota and immunological responses, which can raise the risk of VVC in addition to estrogen. It is normal for the immune system to suppress during pregnancy in order to accommodate the developing baby, particularly due to a decrease in cell-mediated immunity. This makes pregnant women more susceptible to infections, including VVC.[48,50] Changes in cytokine production during pregnancy may impact *Candida's* immunological response, increasing the susceptibility to VVC.[49,50]

The use of antibiotics during pregnancy might disturb the natural equilibrium of the vaginal microbiota, leading to a decrease in the population of beneficial Lactobacillus species and creating an environment conducive to the growth of *Candida*. Pregnant women often receive antibiotics for various diseases, which increases the risk of VVC.[51] Pregnant women who have diabetes or gestational diabetes have high blood sugar levels, which may create a favorable environment for fungus development. Elevated glucose levels in vaginal secretions may facilitate the establishment of *Candida* colonization.[52] Furthermore, the use of hormonal contraceptives before or during pregnancy might make women more susceptible to VVC as a result of hormonal effects on the vaginal ecosystem.[53,54] Dietary practices like high-sugar diets might raise the risk of VVC by giving *Candida* development more nutrients.[55] Obesity may also modify the vaginal microenvironment and immune response, increasing the vulnerability of people to VVC.[56] A history of recurrent VVC may suggest a susceptibility to future episodes, especially during pregnancy, due to a variety of risk factors.[57]

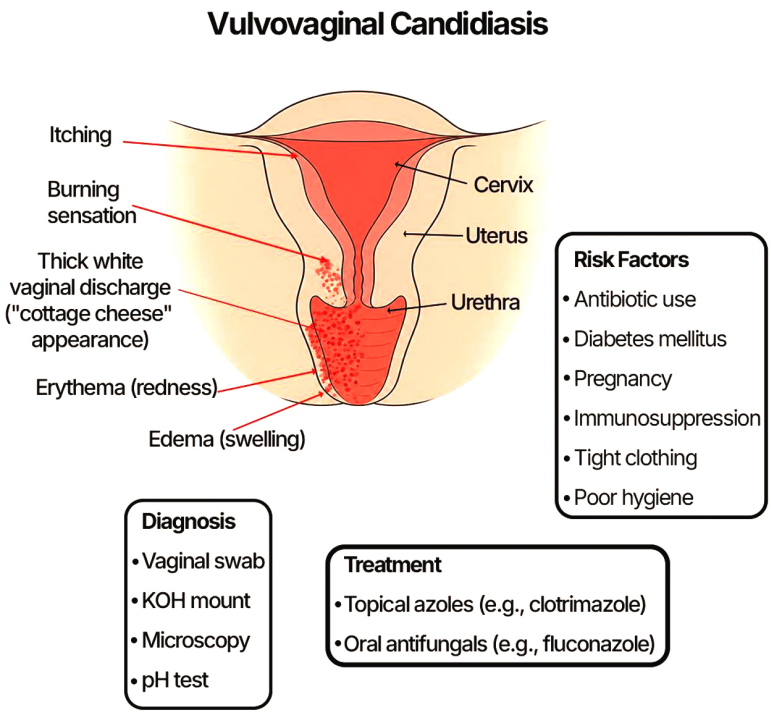

Figure. This illustration highlights common symptoms, risk factors, basic diagnostic methods and treatment options for Vulvovaginal Candidiasis (VVC)

These risk factors emphasize the importance of closely monitoring and managing VVC during pregnancy to prevent adverse outcomes for both the mother and the fetus. Early diagnosis and appropriate treatment are critical to reducing these risks.

Diagnostic advances

A combination of laboratory tests and clinical examination usually diagnoses pregnant women with vulvovaginal candidiasis. Symptoms including burning, itching, and irregular vaginal discharge are common in pregnant women.[58] It is crucial to remember that these symptoms are not unique to VVC and may be brought on by other illnesses.[4] Most pregnant women do not exhibit symptoms; however, a considerable percentage may have *Candida* species in their vagina. Since therapy is usually not required for asymptomatic colonization, it is crucial to differentiate between colonization and actual infection.[59] When the patient exhibits abnormal pelvic findings, we will consider direct microscopy when collecting a vaginal swab. Vaginal discharge's pH was evaluated in addition to direct microscopy.[30] The fundamental methods for diagnosing candidiasis are microscopic analysis of a 10% potassium hydroxide wet mount preparation and Gram stain preparation from the vaginal discharge of clinically positive pregnant women.[49,60,61]

Microscopic examination can detect the presence of *Candida*, however, it is unable to identify the specific species. Therefore, additional methods for species identification of *Candida* are required, such as culturing on Sabouraud dextrose agar (SDA). Because of *Candida* while inhibiting the growth of bacteria due to its acidic pH and antibiotic properties.[62,63] Figure depicts a summary of the clinical features, risk factors, diagnosis, and treatment of vulvovaginal candidiasis.

CHROM agar is often used for identifying mixed cultures.[64-66] By observing how various *Candida* species react with the chromogenic substrate after an incubation period at 37 °C, one can identify species using a fungal culture medium known as CHROM agar. Different *Candida* species result in distinct colony types and colors.[66,67] Another technique for identifying *Candida* species is the germ tube test. This approach is useful for identifying hyphae of *Candida* species, such

Table 1. New rapid methods for diagnosis of VVC

Rapid Card Test	Sensitivity	Specificity	Description	Ref.
BD Affirm VPIII Microbial ID Test	90%-95%	85%-90%	Detects *Candida* species, *Gardnerella vaginalis*, and *Trichomonas vaginalis* from vaginal samples.	72
OSOM BVBlue Test	85%-90%	80%-85%	Rapid detection of elevated sialidase activity in vaginal fluid, indicative of bacterial vaginosis and *Candida* infections.	73
FemExam Test Card	87%-92%	82%-87%	Detects elevated vaginal pH and amines, which can be indicative of bacterial vaginosis and *Candida* infections.	74
Vaginitis Plus Test	90%-94%	88%-92%	Detects *Candida* species, *Gardnerella vaginalis*, and *Trichomonas vaginalis* with a simple card-based test.	75
Solana *Candida* Assay	88%-93%	90%-95%	Nucleic acid amplification test for rapid detection of *Candida* species.	76
GeneXpert *Candida* Assay	92%-96%	91%-95%	PCR-based test for the detection of *Candida* species directly from vaginal swabs.	77
Candida VagiCard	85%-90%	80%-85%	Immunochromatographic test for rapid detection of *Candida* antigens in vaginal fluid.	78
TaqMan *Candida* Test	89%-93%	88%-92%	Real-time PCR test for the detection of *Candida* DNA.	79
QuickVue *Candida* Assay	87%-91%	85%-89%	Rapid immunoassay for detection of *Candida* antigens.	80
Candida albicans Rapid Test	90%-94%	86%-90%	Immunochromatographic test specifically for *Candida albicans*.	81
Nano CHROM *Candida* Test	91%-5%	90%-94%	Nanoparticle-based test for quick detection of *Candida* species.	82

Table 2. Molecular methods for diagnosis of VVC

Method	Description	Ref.
PCR (Polymerase Chain Reaction)	A molecular technique that amplifies DNA sequences of *Candida* species, providing high sensitivity and specificity.	83
Next-Generation Sequencing (NGS)	High-throughput sequencing technology that identifies and quantifies microbial communities, including *Candida* species.	84
LAMP (Loop-mediated Isothermal Amplification)	A single-tube technique for the amplification of DNA, offering rapid and simple detection of *Candida* species.	85
qPCR (Quantitative PCR)	A PCR technique that quantifies the DNA of *Candida* species, providing both detection and measurement of infection load.	86
Digital PCR (dPCR)	A highly sensitive PCR technique that partitions the sample into many individual reactions, enabling precise quantification of *Candida* DNA.	87
MALDI-TOF MS (Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry)	A technology that identifies microorganisms based on the unique protein fingerprint of their cellular components.	88
T2 *Candida* Panel	A magnetic resonance-based diagnostic panel that detects *Candida* species directly from whole blood.	89
Metagenomic Sequencing	A sequencing method that analyzes all genetic material in a sample, providing comprehensive profiling of microbial communities including *Candida* species.	90
CRISPR-based Diagnostics	A novel method using CRISPR-Cas systems for the rapid and specific detection of *Candida* DNA.	91
Biosensors	Devices that use biological molecules to detect the presence of *Candida* species, offering rapid and specific detection.	92

as *Candida albican* and *Candida dubliniensis*, hyphae formers generate hyphae when cultured in serum for two to four hours at 35 °C.[67,68] The yeast assimilation test is the most secure way to identify non-*candida albican* species. The basis for this test is yeast's capacity to digest organic substances. Additional quick test kits are available for the diagnosis of *Candida*, such as the Immunologic Latex Agglutination Test.[17,67,68] In addition to species identification, modern molecular techniques, including polymerase chain reaction (PCR) and 18S rRNA gene clone library approaches, enable the detection of drug-resistant *Candida*. The fundamental idea behind PCR is the large-scale amplification of the target DNA at varying temperatures.[69]

In order to provide an accurate diagnosis, guide appropriate and safe treatment, reduce difficulties for mothers and newborns, and promote larger public health goals, diagnostic testing for VVC in pregnant women is important. For mother and fetus health, accurate and timely diagnosis is crucial. Even though more diagnostic tests are available clinical diagnosis and direct microscopy techniques were enough to prescribe medication.[70,71] But Accurate diagnosis ensures appropriate treatment, improving outcomes for pregnant women with VVC.

Table 1 includes commercially available rapid card or molecular tests; the reported sensitivity and specificity ranges, a short description of the detection principle or target and references. These means are faster and easier to use in the clinical/point-of-care setting compared to conventional culture-based diagnostics.

Table 2 shows advanced molecular tools for diagnosis of vulvovaginal candidiasis (VVC). Compared to traditional methods, they provide improved sensitivity, specificity, and rapid detection. Each method is based on different principle from DNA amplification and sequencing through protein identification to biosensor devices, offering a set of techniques for accurate identification of *Candida* spp.

Therapeutic strategies

Treatment options for VVC in expectant mothers vary according to the severity and stage of the condition. Topical treatment or a single oral dosage can treat *Candida albicans* cases that are

Table 3. Antifungal Agents and Risk Categories Used in Pregnancy

Pregnancy Category	Drug Class	Drug Name	Risk in Pregnancy	Ref.
A	Polyenes	Nystatin	Safe in pregnancy; no known risk of congenital abnormalities.	96, 112
B	Azoles	Clotrimazole	Generally considered safe with no increased risk of major malformations.	105, 106, 112
B	Allylamines	Terbinafine	Generally considered safe; no increased risk of major malformations.	96, 112
B	Polyenes	Amphotericin B	Generally considered safe; preferred for serious systemic fungal infections during pregnancy.	96, 112
C	Azoles	Miconazole	Animal studies show adverse effects; may be used if maternal benefits outweigh fetal risks.	96, 107, 112
C	Azoles	Fluconazole	Low doses generally considered low risk; prolonged or high-dose therapy has been associated with congenital abnormalities.	106, 107, 112
C	Azoles	Itraconazole	Animal studies demonstrate fetal risk; use only when potential benefits outweigh risks.	96, 112
C	Azoles	Ketoconazole	Animal studies demonstrate fetal risk; avoid unless clearly indicated.	96, 112
C	Echinocandins	Caspofungin	Animal studies show fetal toxicity; insufficient human safety data.	96, 112
C	Echinocandins	Micafungin	Animal studies show fetal toxicity; insufficient human safety data.	96, 112
C	Echinocandins	Anidulafungin	Animal studies show fetal toxicity; insufficient human safety data.	96, 112
D	Azoles	Voriconazole	Evidence of human fetal risk; use only for life-threatening infections when benefits outweigh risks.	96, 112

not too difficult. Probiotic therapy for VVC is still debatable and lacks clear evidence.[93-96] Longer treatment periods with oral fluconazole or daily topical azoles may be required for more severe or complex cases.[97-100] Probiotic therapy for VVC is still debatable and lacks clear evidence. Local antifungal treatment, either vaginal or along with oral medication, has been shown to be equally effective in preventing the return of VVC in all three trimesters of pregnancy.[101-103]

Topical azole antifungals, especially clotrimazole, are often recommended as first-line treatment because of their well-established safety profiles and high concentration in vaginal secretions.[104,105] Oral fluconazole is typically not recommended for use during pregnancy, particularly in the first trimester, owing to the risks of causing birth defects (teratogenic hazards).[106] However, some research suggests that short-term oral fluconazole may be a possibility in later trimesters, its use should be evaluated on a case-by-case basis after carefully weighing the benefits and drawbacks.[107] It is critical to understand that antifungal resistance, especially to azoles, is a growing problem.

As a result, doctors should be aware of local resistance trends and undertake antifungal susceptibility testing as necessary. Due to their well-established safety profile, topical azoles, particularly clotrimazole, are widely used.[105,106] Commercially available antifungal medications for the treatment of Candidiasis include imidazole, triazole, and polyene antifungals.[108] According to other studies topical imidazole appears to be more effective than nystatin for treating symptomatic vaginal candidiasis in pregnancy.[107,109,110] Various studies concur that a seven-day antifungal topical medication is the best option for treating candidiasis in pregnant women, as shorter therapy is associated with treatment failure.[11,27,109] Treatment varies depending on vaginal options and should be based upon antifungal susceptibility tests when the causative agent belongs to the NAC species, such as *C. krusei, C. dubliniensis,* and *C. glabrata*, which are commonly resistant to fluconazole.[11,27,111]

Table 3 summarizes commonly used antifungal agents by class and their U.S. FDA Pregnancy Categories (A-D), along with associated teratogenic risks during pregnancy. It serves as a

clinical guide for selecting appropriate antifungal therapy by balancing potential maternal benefits against fetal risks based on available human and animal data. Clotrimazole, Terbinafine, and Amphotericin B (Category B) are generally safe with no increased risk of malformations. Drugs in Category C, like Miconazole and Fluconazole, show some animal study risks but may be used if benefits outweigh risks. Voriconazole (Category D) has evidence of human fetal risk but may be used in serious infections if necessary.[96,112] Overall, the table serves as a clinical guide for selecting appropriate antifungal therapy during pregnancy by balancing maternal benefits against potential fetal risks based on available human and animal data.

Role of probiotics

Researchers have investigated the advantages and disadvantages of probiotic treatment for vulvovaginal candidiasis (VVC) in pregnant women. Probiotic usage, especially *Lactobacillus* species, attempts to maintain and repair the natural vaginal flora, which might be upset by a *Candida* infection.[93] Pregnant women widely regard probiotic treatment as safe and may find it helpful in controlling VVC.[94] Probiotics, particularly *Lactobacillus* strains, produce lactic acid, which lowers vaginal pH and prevents *Candida* growth, they also produce hydrogen peroxide and bacteriocins, which directly inhibit pathogenic microorganisms.[95] These actions help maintain a healthy vaginal microbiome.

According to several studies and reviews, pregnant women may safely take probiotics, particularly those of the *Lactobacillus* species. Between the probiotic and placebo groups, there have been no discernible variations in the incidence of major or mild side effects. The examined trials often observed side effects such as gastrointestinal problems and local irritation, which did not significantly vary across groups.[94,96,97] Probiotics are often thought to be risk-free, well tolerated, and have few side effects. Nevertheless, the safety characteristics may differ based on the specific probiotic strains used and the health condition of the person.[98]

Lactobacillus rhamnosus GR-1, *Lactobacillus reuteri* RC-14, and *Lactobacillus acidophilus* are among the probiotic strains that are effective for VVC. These strains' positive effects on vaginal health have been the subject of significant research.[99,101] Probiotics may be beneficial or ineffective depending on the amount and method (vaginal suppositories, oral capsules, or both). Studies reveal that consistent daily ingestion for at least four weeks yields significant results.[100,104]

Probiotics may be especially beneficial for women who have recurrent vulvovaginal candidiasis (VVC) as a preventative strategy. Frequent use of probiotics may aid in preserving a harmonious vaginal microbiota and diminishing the occurrence of infections.[105,110] Probiotic supplementation with antifungal medications has been associated with varying degrees of benefit, with some trials reporting no discernible increase in clinical cure rates. While probiotics may be beneficial in certain situations, their use as a main therapy should be considered an adjuvant measure.[102,111] While there is no general agreement, several clinical recommendations and evaluations indicate that probiotics may be an effective addition to traditional antifungal therapies, especially for recurrent VVC. Many recommend probiotics as a supplement because of their safety profile and potential benefits; however, more research is necessary to establish definitive guidelines.[96,112]

These findings suggest that probiotic therapy, when combined with antifungal medication, might be a safe and possibly useful supplementary treatment for VVC in pregnant women. However, it is crucial to use it under a doctor's supervision and in conjunction with other antifungal medications.

CONCLUSION

Treating vulvovaginal candidiasis (VVC) during pregnancy requires the use of antifungal and probiotic treatments. Pregnant women have a notably greater occurrence of VVC as a result of hormonal and physiological alterations. There are several methods for diagnosing candidiasis, including clinical signs and symptoms, microscopy, culture, serology, germ tube testing, sugar absorption, and PCR. Topical azoles, such as

clotrimazole, are first-line therapies because of their effectiveness and safety. Oral fluconazole is often contraindicated during the first trimester owing to possible hazards, although it may be contemplated at a later stage. Probiotics, particularly *Lactobacillus* strains, help to restore the normal balance of microorganisms in the vagina and prevent excessive *Candida* development. When used with antifungal medication, they have additional benefits, potentially decreasing the likelihood of the condition recurring. Nevertheless, more study is required to create universally accepted norms.

Rapid and precise diagnosis is critical for effective treatment and avoiding complications such as premature labor and neonatal candidiasis. Techniques like PCR and rapid card testing improve diagnostic accuracy, allowing for quick action. Overall, when combined with a proper diagnosis, antifungal and probiotic therapy may improve outcomes for pregnant women with VVC while protecting maternal and fetal health

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

ETHICS STATEMENT

Not applicable.

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