

## Vaginal infections: epidemiology and risk factors

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SUMMARY: Vaginal infections: epidemiology and risk factors.

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*Vaginitis is the most common gynaecologic condition encountered by physicians in the office. The actual frequency of vaginitis is difficult to ascertain, due to numerous confounding factors, such as a high asymptomatic rate, inaccurate self-diagnosis and treatment. Vaginitis affects all races and age groups.*

*Bacterial vaginosis (BV), vaginal candidiasis, and T. vaginalis infection are thought to cause approximately 90% of all vaginal infections.*

*Recently, the term "aerobic vaginitis" has been proposed to define a "new" vaginal pathology characterised by pH values above 5, yellowish and foul smelling secretions (though negative at the KOH test), inflammatory and dyspareunia manifestations, the lack of increase in anaerobic microorganisms and the presence of aerobic bacteria from the rectal reservoir.*

*A complex and intricate balance of microorganisms maintains the normal vaginal flora. Important organisms include lactobacilli, corynebacteria, and yeast. Hormones further influence this microenvironment: the decrease in estrogens can result in an altered risk of infection. The normal postmenarchal and premenopausal vaginal pH is 3.8-4.2. At this pH, growth of pathogenic organisms usually is inhibited.*

*Disturbance of the normal vaginal pH can alter the vaginal flora, leading to overgrowth of pathogens.*

*Factors that alter vaginal environment include feminine hygiene products, contraceptives, vaginal medications, antibiotics, sexually transmitted diseases (STDs), sexual intercourse, and stress.*

RIASSUNTO: Infezioni vaginali: epidemiologia e fattori di rischio.

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*La vaginite è la più comune condizione ginecologica di riscontro ambulatoriale. La frequenza attuale della vaginite è di difficile determinazione, a causa dei numerosi fattori confondenti, quali l'elevata assenza di sintomi, auto-diagnosi e trattamento inaccurati.*

*La vaginite colpisce tutte le razze e le fasce di età.*

*Vaginosi Batterica (BV), candidiasi vaginale, e T. vaginalis sono ritenute la cause di circa il 90% di tutte le infezioni vaginali.*

*Recentemente, il termine "vaginite aerobica" è stato proposto per definire una "nuova" patologia vaginale caratterizzata da valori di pH > 5, secrezioni maleodoranti e giallastre (sebbene negative al test KOH), manifestazioni infiammatorie e dyspareunia, la mancanza di aumento di microorganismi anaerobi e la presenza di batteri aerobi dall'ambiente rettale.*

*Un complesso equilibrio di microorganismi mantiene la flora vaginale nella normalità. Importanti organismi includono lattobacilli, corynebacteri e lieviti. Inoltre, gli ormoni influenzano questo microambiente: la diminuzione degli estrogeni può portare ad un alterato rischio di infezioni. Il pH vaginale normale postmenarca e premenopausa è di 3.8-4.2. A questo pH, la crescita di organismi patogeni è solitamente inibita.*

*Alterazioni del normale pH vaginale (prodotti per l'igiene intima, contraccettivi, topici vaginali, antibiotici, malattie sessualmente trasmesse (STDs), rapporti sessuali e stress, possono modificare la flora vaginale, portando a sovracrescita di patogeni.*

KEY WORDS: Vaginitis - Bacterial vaginosis - Candidiasis - Aerobic vaginitis.  
Vaginiti - Vaginosi batterica - Candidiasi - Vaginite aerobica.

Vaginitis is a very common disease, affecting millions of women and is one of the primary reasons why women visit their doctor, but, among these, the true incidence of vaginal infections is difficult to ascertain, since most women and sometimes their doctors use the term vaginitis as a synonym for infections, assuming that all vulvovaginal irritations or itching, especially when accompanied by abnormal secretions, is caused by microorganisms.

When symptoms are acute, infection is the most common cause, but chronic symptoms often have different or additional aetiologies, and any patient with vaginitis who does not respond to antinfective therapy should have her infection confirmed by laboratory tests.

Furthermore, the actual frequency of infectious vaginitis is also difficult to ascertain, due to numerous confounding factors, such as a high asymptomatic rate, inaccurate self-diagnosis and treatment, and population dependence. In the USA, the reported rate at general gynaecologic clinics is 5-15%, while for STD clinics, reported rates range from 32% to as

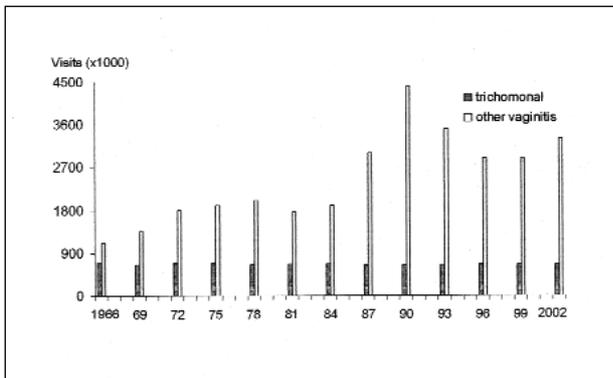


Fig. 1 - Trichomoniasis and other vaginal infections: initial visits to physicians' offices (USA 1966-2003).

Biologic	Behavioural
<ul style="list-style-type: none"> <li>• Pregnancy</li> <li>• Uncontrolled diabetes</li> <li>• Corticosteroids/immunosuppressive therapy</li> <li>• Antimicrobial therapy</li> <li>• HIV infection</li> </ul>	<ul style="list-style-type: none"> <li>• Oral contraceptives</li> <li>• Intrauterine devices</li> <li>• Nonoxynol-9</li> <li>• Oral sex</li> <li>• Coital frequency</li> <li>• Wet bathing costumes for long time</li> </ul>

Fig. 2 - Acquired host factors associated with asymptomatic vaginal colonization by candida and with candida vaginitis.

high as 64%.

European rates are uncertain but probably are similar to those in the United States.

Vaginitis affects all races, but the highest incidence is in African Americans and the lowest incidence is in Asians. All age groups are affected, even if the highest incidence is noted among young, sexually active women.

Among infectious vaginitis we can consider some very rare syndromes such as atrophic vaginitis with secondary bacterial infection, foreign body with secondary bacterial infection, ulcerative vaginitis associated with *S. aureus* and toxic shock syndrome and idiopathic vulvovaginal ulceration associated with HIV, but the most common causes of the vast majority of the lower genital tract infections, are yeasts (such as *Candida* species), protozoa (*Trichomonas vaginalis*) and selected anaerobic vaginal bacteria (such as *Gardnerella vaginalis*, *peptococcus*...).

These microorganisms are responsible for the three most common diseases associated with vaginal infection, that is trichomoniasis (from 5 to 20%), bacterial vaginosis (40-50%), and vulvovaginal candidiasis (20-35%), not infrequently, in combination.

The rate of incidence can be different according to area or time of recording, but constantly *T. vaginalis* shows the lowest incidence, even if their absolute value is high and it may be emerging as one of the most important cofactors in amplifying HIV transmission (Fig.1).

The second most common cause of vaginal infection is candidiasis.

In the second half of the last century, the incidence of vaginal candidiasis increased dramatically (1).

It is estimated that 75% of women experience at least one episode of vulvovaginal candidiasis during their childbearing age, and approximately 40% experience a second attack.

A small, not determinable, subpopulation of women (less than 10%) suffers from recurrent, often intractable episodes.

Apart from genetic factors such as blood group antigen/secretor status, acquired host factors associated with asymptomatic vaginal colonization by candida and with candida vaginitis (Fig. 2) could be responsible for the increase.

Particularly:

- pregnancy (may reduce the immune system's ability to fight infections);
- diabetes (body secretions, including vaginal secretions, have increased glucose levels and body tissues stop functioning normally and this impairs the immune system's ability to fight infection);
- the number of sexual partners generally has no correlation with yeast infections even if;
- oral sex: transmission possible if person has yeast in mouth;
- oral contraceptives (more women have sexual intercourse and the ejaculate is a very strong immuno-suppressive agent and can harm local immune response);
- other contraceptives (I.U.D., diaphragm, cervical cap can change the vaginal flora).

It is also significant that the percentage of non-*albicans Candida* infections is also rising dramatically.

In the 1970s, the incidence of non-*albicans* vaginal infections was approximately 5% to 10%, and in the 1980s it increased from 15% to 25%.

A study in the 1980s involving 728 isolates from women with vaginal candidiasis showed in England a prevalence of 21.3% non-*albicans* species (1), while in Italy, Parazzini F. et al. (4) in 2000, registered an extremely high isolation rate of non-*albicans* species (50.9%).

A more recent epidemiological study did not con-

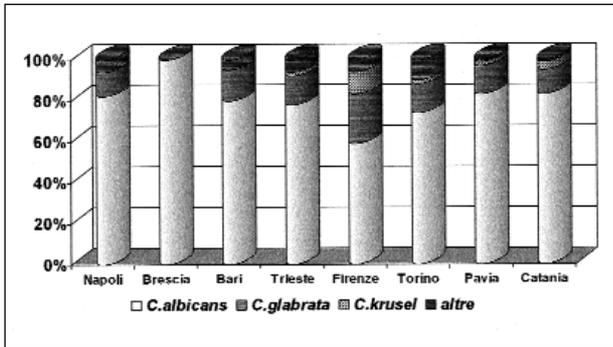


Fig. 3 - An epidemiological survey of vulvovaginal candidiasis in Italy.

### Signs and symptoms      Grading of vaginal smears

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Leucorrhoea, yellowish and bad smelling</li> <li>• KOH test, negative</li> <li>• Slight inflammation</li> <li>• Moderate burning and/or redness</li> </ul> | <ul style="list-style-type: none"> <li>• Grade 1: normal flora predominantly lactobacillary morphotypes very few coccoid bacteria present</li> <li>• Grade 2: intermediate flora reduced lactobacillary flora mixed with other bacteria</li> <li>• Grade 3: abnormal flora no lactobacilli present numerous other bacteria</li> </ul> |
|---|---|

Fig. 5 - Definition of a type of abnormal vaginal flora that is distinct from bacterial vaginosis: aerobic vaginitis.

firm these Italian data.

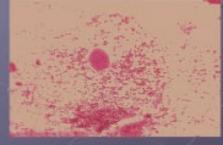
In fact, Corsello S. et al. (2) showed, in a multicentre study involving 8 Italian Gynecological and Microbiological Centers that the incidence of *Candida albicans* species was always higher than 60% (Fig. 3).

Among non-*albicans* species, *C. glabrata* was the most isolated.

From a worldwide perspective, bacterial vaginosis (BV) continues to be the leading variety of vaginal infections.

Bacterial vaginosis has been defined as a polymicrobial alteration in vaginal flora causing an increase in vaginal pH, sometimes associated with a homogenous discharge, but in the absence of a demonstrable inflammatory response (Eschenbach et al., 1988).

It has been established that infectious vaginitis are:

1. **SPECIFIC VAGINITIS:**  
 Trichomonas vaginalis  Candida spp. 
2. **BACTERIAL VAGINOSIS** 

IS THERE ANYTHING ELSE ?

Fig. 4 - Definite infectious vaginitis.

... the culture examination demonstrated the constant presence of **aerobic** bacteria from rectal reservoir, *E.coli* was the most frequently isolated pathogen (alone or in association with other Enterobacteriaceae), while the presence of other microorganisms was not significant, which, in our opinion, was not related to aerobic vaginitis.

Fig. 6 - Aerobic vaginitis: microbiological/clinical characteristics and validation of topical therapy with kanamycin.

It can be easily diagnosed by "Amsel's criteria":

1. a thin, milky white discharge that clings to the walls of the vagina,
2. presence of a fishy odor (a positive amine test),
3. a vaginal pH greater than 4.5,
4. the presence of "clue cells" (vaginal cells that are covered with small bacteria) in the vaginal smears.

BV is not caused by a particular organism but there is a change in the balance of normal vaginal bacteria with a very high number of bacteria such as *Gardnerella vaginalis*, *Mycoplasma hominis*, *Bacteroides* species, and *Mobiluncus* species.

These bacteria can be found in numbers from 100 to 1,000 times greater than found in the healthy vagina. In contrast, *Lactobacillus* bacteria are in very low numbers or completely absent.

Recently, Donders (3) proposed the term "aerobic vaginitis" to define a "new" vaginal pathology (neither classifiable as specific vaginitis nor as BV) characterised by pH values above 5, yellowish and foul smelling secretions (though negative at the KOH test), and inflammatory and dyspareunia manifestations (Fig.5).

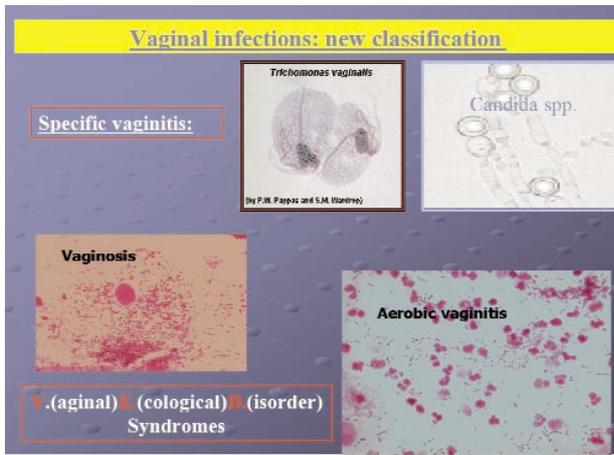


Fig. 7 - Vaginal infections: new classification.

From the microbiological point of view, (5) this is different from BV because of the lack of increase in anaerobic microorganisms and the presence of aerobic bacteria from the rectal reservoir (especially *E.coli*).

It is therefore indicative of an alteration of the

vaginal homeostasis with a consequent increase of enteric bacteria vaginal colonization.

Therefore I propose a new classification of vaginal infections, including aerobic vaginitis together with vaginosis in a group of vaginal ecological disorders (Fig. 7).

### Importance of vaginal ecosystem

It is well known that vaginitis results from alterations in the vaginal ecosystem, either by the introduction of an organism or by a disturbance that allows normally present pathogens to proliferate. The vaginal flora is highly susceptible to numerous endogenous and exogenous influences, such as contraceptives, vaginal medications, antibiotics, sexually transmitted diseases (STDs), sexual intercourse, and stress.

As regards feminine hygiene products, it is extremely important to choose the best douching; that means not only not containing harsh solution but also respecting the different pHs that characterize the vaginal ecosystem during a women's life.

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