Genital infections are one of the most common reasons for women of all age groups to present to a medical practitioner. It is important to differentiate normal physiological changes from true infection. *Vulvovaginitis, vulvitis, and vaginitis are general terms that refer to the inflammation of the vagina and/or vulva.*

### Normal Vaginal Ecosystem

**Characteristics:**
A dynamic equilibrium exist between the intact stratified epithelium, normal colonizing microorganisms, and local secretory (hormonal) and cellular immune factors. Vaginal pH is low (3.5-4.5).

*Estrogen increases vaginal epithelial glycogen.*

*Glycogen is metabolized by lactobacilli into lactic acid.*

*pH is acidic and is unfavorable for pathogens.*

### Normal Flora:

1. **Lactobacillus:**
   - ***Found in 96% of women.***
   - ***Concentrations $10^5$ to $10^8$ / ml.***
   - ***Protective effect by interfering with adherence to epithelial cells.***
   - Some lactobacilli also produce hydrogen peroxide (H2O2), a potential microbicidal agent.

2. **Facultative organisms:** Diphtheroids – streptococci – E.coli – ureaplasma urealyticum – mycoplasma hominis

3. **Anaerobic organisms:** Peptostreptococci – bacteroid - fusobacterium

### Terminology

**Vaginitis:** significant inflammatory response in vaginal wall. Accompanied by high number of leukocytes in vaginal fluid. Found with candida and trichomonas infections.

**Vaginosis:** minimal inflammatory response with few leukocytes in vaginal wall. Associated with increase in bacterial concentrations.

**Leukorrhea:** a non-infective, non-bloodstained physiological vaginal discharge.

### Physiological discharge
it occurs in response to hormonal levels during the menstrual cycle. Usually white and changes to a more yellow color due to oxidation on contact with air. There is increased mucous production from the cervix at the time of ovulations followed by a thicker discharge/cervical plug under the influence of progesterone. The discharge mainly consist of mucous, desquamated epithelia cells, bacteria (lactobacillus) and fluid.

The amount varies dependent on multiple factors:

1. Age
2. Timing of Menstrual Cycle
3. Sexual arousal
4. Contraceptive use
5. Douching
Pathological discharge
Vaginal discharge is the most common gynaecologic condition encountered by physicians in the office.

Pathophysiology: Disturbance of the normal vaginal pH and estrogen levels can alter the vaginal flora, leading to overgrowth of pathogens. Factors that alter vaginal environment include feminine hygiene products, contraceptives, vaginal medications, antibiotics, STDs, sexual intercourse, and stress.

Frequency: Difficult to determine. 5-15% of visits.

Mortality/Morbidity:
1. Chronic irritation, excoriation, and scarring.
2. STD
3. PID
4. Increased risk of premature rupture of the membranes, preterm labour, and preterm delivery.

Vaginitis:
Most common causes include:
1. Vulvovaginal Candidiasis (VVC) (20-25%).
2. Bacterial Vaginosis (BV) (23-50%).
3. Trichomoniasis (5-15%).
*In some cases the etiology may be mixed (20%).

Symptoms: Often non-specific:
1. Abnormal discharge
2. Vulvovaginal irritation
3. Vulvar itching
4. Odor

Bacterial Vaginosis
Most common cause of vaginal complain. Up to 50% are asymptomatic. Characterized by foul-smelling vaginal discharge with no obvious inflammation.
(Previously known as nonspecific vaginitis, Hemophilus vaginalis or Corynebacterium vaginale, Gardnerella vaginalis)
It is not caused by a particular organism but there is a change in the balance of normal vaginal bacteria.

Very high numbers of bacteria such as Gardnerella vaginalis, Mycoplasma hominis, Bacteroides species, and Mobiluncus species. These bacteria can be found at numbers 100 to 1000 times greater than found in the healthy vagina. In contrast, Lactobacillus bacteria are in very low numbers or completely absent.

Bacterial vaginosis is not considered a sexually transmitted disease although it can be acquired by sexual intercourse.

BV linked to: premature rupture of membranes, premature delivery and low birth-weight delivery (Women with such history should have a vaginal swab performed in the 1st trimester)
and if BV detected, it should be actively treated in the early 2nd trimester of pregnancy. Metronidazole is safe in pregnancy, acquisition of HIV, development of PID, and postoperative infections after gynecological procedures.

Male sex partners may be colonized but asymptomatic.

Bacterial vaginosis tend to occur more frequently in women who have using an intrauterine device (IUD), non-white race, prior pregnancy, first sexual activity at an early age, having multiple sexual partners, and having a history of sexually transmitted diseases.

The discharge is more prominent during and after menstruation.

**Diagnosis:**

Amsel’s criteria (must have at least 3 of these findings)

* Creamy grayish white, homogeneous discharge adherent to walls
* pH > 4.5 (more alkaline)
* Fishy odor with KOH (10%) [Whiff test; fishy odor due to increased activity of anaerobic species. Addition of KOH will augment this odor.]
* Clue cells on wet prep (>20% per HPF of “clue cells”, clue cells are epithelial cells which are covered with bacteria giving the cell a “furlike” appearance or stippled appearance).

**Treatment:**

Symptomatic gynecologic and obstetric patients.

Selected asymptomatic gynecologic patients (e.g. undergoing surgery)

Selected asymptomatic obstetric patient (e.g. SROM or preterm labor)

**Medication:** CDC 1998

Oral: metronidazole 400mg bid for 5 days (single dose of 2 g), or clindamycin 300mg bid for 7 days.

Vaginal: metronidazole gel 0.75% at night for 5-7 days, or clindamycin cream 2% for 7 days.

**NO TREATMENT OF SEXUAL PARTNER IS NEEDED.**

**TRICHOMONIASIS**

**Etiologic agent**

* *Trichomonas vaginalis* – a single cell flagellated protozoan.
* Humans are the only host
* Sexually transmitted.
* Can also cause urinary tract infection.

It is usually sexually transmitted disease.

This means that the disease is passed from person-to-person only by sexual contact. Trichomoniasis occurs in both men and women.

in rare instances it has been passed through wet towels, washcloths or bathing suits.

Trichomoniasis is primarily an infection of the urogenital tract; the urethra is the most common site of infection in men, and the vagina is the most common site of infection in women.
Possible association with:
* Pre-term rupture of membranes and pre-term delivery.
* Increased risk of HIV acquisition.

**DIAGNOSIS**
* Copious, yellow-green or gray frothy discharge, adherent to vaginal walls, with foul odor.
* Vulvovaginal soreness and itching.
* Punctate cervical microhemorrhages seen in 25%: *strawberry cervix*
* Saline smear 70% sensitive, highly specific (motile trichomonads).
* Liquid culture, Diamond’s medium, done in persistent cases.
* Gram stain & Pap smear are not sensitive or specific.
* Whiff test (KOH) +/-.
* Dysuria and abdominal discomfort.

**Management**: CDC, 1998

Both partners should be treated and both should be screened for other STDS.

**Recommended regimen**
Metronidazole 400 mg PO bid for 7 days, Metronidazole 2 gm orally in a single dose (cure rate up to 95%).

Tinidazole in a single oral dose of 2 g is equally effective but more costly.

**Pregnancy**
Metronidazole 2 gm orally in a single dose.

Avoid intercourse until therapy is completed and patient and partner are asymptomatic.

No alcohol for the duration of treatment and for at least 24 h after the last dose.

**VULVOVAGINAL CANDIDIASIS**

vulvovaginal candidiasis," candidal vaginitis," "monilial infection," or "vaginal yeast infection”.

* Not considered to be STD. Its one of the most common genital infection.

* Caused by overgrowth of Candida species  (Candida species are normal flora of vagina)

In 80-90% of the cases, is caused by an overgrowth of the yeast **Candida Albicans**

In 10 – 20 % is caused by Candida glabrata or candida tropicalis,C.krusei and C.parapsilosis.

C.albicans is **adiploid fungus** and is a common commensal in the gut flora.

**RISK FACTORS**
1. Uncontrolled DM
2. Corticosteroid therapy
3. Antimicrobial therapy (oral, parental, topical)
4. Poor hygiene
5. Estrogen therapy(HRT)
6. High-dose estrogen contraceptive
7. Pregnancy
8. IUD
9. HIV infection and immunosupression.
10. Sponge
11. Increased frequency of coitus
12. “Candy binge”
13. Women frequenting STD clinics
14. Tight-fitting synthetic underclothing

But, most episodes of vulvovaginal candidiasis occur in the absence of a recognizable precipitating factors

Symptoms:
Vulval itching,
Soreness, vulval excoriation and redness.
Painful sexual intercourse(dyspareunia) or there may be pain on passing urine(dysuria),
A thick, curdy, white (like cottage cheese) vaginal discharge.

Most male partners of women with VVC do not experience any symptoms of the infection. However, a transient rash and burning sensation of the penis have been reported after intercourse if condoms were not used. These symptoms are usually self-limiting. Clinically, vulvar erythema and edema with satellite lesions (discrete pustulopapular lesions). Normal vaginal pH.

CLASSIFICATION

<table>
<thead>
<tr>
<th>Uncomplicated</th>
<th>Complicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sporadic, infrequent</td>
<td>Recurrent</td>
</tr>
<tr>
<td>Mild-to-moderate</td>
<td>Severe</td>
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<tr>
<td>Likely C albicans</td>
<td>Non-albicans</td>
</tr>
<tr>
<td>Non-immunocomprised</td>
<td>Diabetes, pregnancy, immunosuppression</td>
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</tbody>
</table>

Diagnosis:
It is important to confirm the diagnosis with a perineal and/or vaginal swab. Conditions such as contact dermatitis, allergic reactions and non-specific vaginal infections can present in a similar manner.

*Vulvar erythema and edema.
*Vaginal pH is usually normal.
*Wet prep: detects 70%, hyphae and pseudohyphae (100% specific).
*Culture: is most sensitive
*Whiff test: negative
*Fungal stain positive

30% may have a negative fungal stain.

Up to 30-40% of asymptomatic women may have C. albicans grown on vaginal swab. These not need treatment even if pregnant.

Management: CDC, 1998.
*Vaginal antifungal creams: Azoles/imidazoles are the mainstay of treatment (econazole, clotrimazole, miconazole for 7-14 d).

*Oral antifungal: oral imidazoles (fluconazole in a single 150 mg dose) or itraconazoles 200 mg twice a day for one day (these are contraindicated in pregnancy).

*Avoid or remove risk factors such as high dose pill change to low dose pill, treat diabetes, avoid recurrent courses of antibiotics.

**NO TREATMENT OF SEXUAL PARTNER IS NEEDED**

**Recurrent vaginal candidiasis**

*Some women have four or more attacks per year or a positive microscopy of moderate to heavy growth of C. albicans.

*Chronic or recurrent infections may occur. This may be from inadequate treatment or self-reinfection.

*Secondary infection may occur. Intense or prolonged scratching may cause the skin of the vulva to become cracked and raw, making it more susceptible to infection.

*Diabetes mellitus or immunosuppression should be considered in refractory/recurrent cases.

*Simultaneous Rx of sex partners has no effect on recurrence (but 3-10% of sex partners may have balanitis).

*Vaginal culture useful to confirm diagnosis and identify unusual species.

In such cases the principle of treatment would be an induction regimen to treat acute infection followed by a maintenance regimen to treat further recurrences.

Commonly fluconazole 150 mg is given in three doses orally every 72 h followed by a maintenance dose of 150 mg weekly for 6 months.

Oral imidazoles cannot be used in pregnancy but a topical imidazole can be used for 2 weeks for induction followed by a weekly dose of clotrimazole 500 mg for possibly 6-8 weeks.

Restoration of the normal ecosystem of the vagina (oral/vaginal Lactobacillus). Proper hygiene, dietary intake of CHO and yeast (no evidence to support this).

Control, and management of stress also are important factors in control of recurrent vaginal infections.

**Prevention**

- Treatments should not be taken unless the woman had been diagnosed
- Douching should be avoided because it may disturb the balance of organisms in the vagina and may spread them higher into the reproductive system.
- Avoid wearing tight clothing and wear cotton underwear.
- Thoroughly dry oneself after bathing and remove a wet bathing suit promptly.
- After a bowel movement, wipe from front to back to avoid spreading intestinal bacteria to the vagina.

Clean diaphragms, cervical caps, and spermicide applicators after use. Use condoms to avoid sexually transmitted disease. As Trichomonas infection is sexually transmitted,
- Decreasing the frequency of sexual intercourse seems to have more of a scientific basis than other standard advice frequently given to decrease vulvovaginal candidiasis has been found among nonpregnant women.

<table>
<thead>
<tr>
<th>Symptom presentation</th>
<th>Normal</th>
<th>Trichomoniasis</th>
<th>Candidiasis</th>
<th>Bacterial Vaginosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>discharge, itch, 50% asymptomatic</td>
<td>discharge, itch, 50% asymptomatic</td>
<td>Itch, discomfort, dysuria, thick discharge</td>
<td>Odor, discharge, itch</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Vaginal discharge</th>
<th>Clear to white</th>
<th>Frothy, gray or yellow-green; malodorous</th>
<th>Thick, clumpy, white “cottage cheese”</th>
<th>Homogenous, adherent, thin, milky white; malodorous “foul fishy”</th>
</tr>
</thead>
</table>

| Clinical findings | Cervical petechiae “strawberry cervix” | Inflammation and erythema | |
|-------------------|---------------------------------|---------------------------------| |

<table>
<thead>
<tr>
<th>Vaginal pH</th>
<th>3.5- 4.5</th>
<th>&gt; 4.5</th>
<th>Usually ≤ 4.5</th>
<th>&gt; 4.5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>KOH “whiff” test</th>
<th>Negative</th>
<th>Often positive</th>
<th>Negative</th>
<th>Positive</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NaCl wet mount</th>
<th>Lactobacilli</th>
<th>Motile flagellated protozoa, many WBCs</th>
<th>Few WBCs</th>
<th>Clue cells (≥ 20%), no/few WBCs</th>
</tr>
</thead>
</table>

| KOH wet mount | Pseudohyphae | |

**Vaginitis differentiation**