Review Article

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LEUKORRHEA: PHARMACO-ECONOMICAL AND HERBAL PERSPECTIVES

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Abstract: Leukorrhea is a symptom rather than a disease. Both subjectively and objectively, it signifies an underlying disorder, which may be either functional or organic. While this symptom can result from a range of constitutional or systemic conditions, it typically originates from some lesion affecting the reproductive organs. The symptom can manifest at any age, including infancy, childhood, the childbearing years, the menopausal stage, and during senescence. This review article emphasizes the herbal treatment and management of the perspectives related to the ailment. Additionally, it takes into account the economic factors associated with the available medications to enhance patient compliance.

Keywords: Leukorrhea, Herbal, Economical, Pharmaceutical, Treatment

Introduction: Leukorrhea, often known as fluoral bus, is a medical term that denotes an increase in vaginal discharge [1-3]. This discharge generally manifests in hues of yellow, green, or gray. The causes of this discharge can be physiological, pathological, or inflammatory. The vagina naturally produces a small quantity of discharge to ensure cleanliness and health, which is typically clear or white and has a subtle odor. Nevertheless, there are occasions when the amount of this discharge may increase, or its color, consistency, or odor may change [4-5].

Classification of Vaginal Discharge [2]: It is of two types:

1. Physiological discharge
2. Pathological discharge

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Physiological secretions: This is a typical physiological process that frequently takes place during ovulation, pregnancy, or prior to menstruation. The discharge is usually clear, white, or slightly yellowish and has no odor. It comprises a combination of the following secretions:

• Vulval secretions: These are secretions from the Bartholin gland, sebaceous gland, apocrine gland, and sweat gland.

• Vaginal secretions: This includes epithelial debris resulting from the continuous breakdown of superficial epithelial cells.

Pathological Secretions: It is usually an abnormal vaginal discharge that has foul smell or odor is produced in large quantities appear thick and white or curdy in texture.

Leukorrhea, commonly referred to as vaginal discharge, is a widespread issue affecting females and girls aged 26 to 35. This condition frequently causes irritation to the mucus glands located in the cervix. Vaginal discharge can manifest in women globally, with adolescent girls facing a heightened risk. At times, this discharge is simply a normal bodily function, as observed during ovulation, pregnancy, or sexual arousal. These instances are all regarded as standard physiological reasons for an

increase in discharge. However, this condition may lead to symptoms such as itching, redness, swelling, a burning sensation in the genital area, and discomfort during sexual intercourse. The discharge may present as thick, chunky, yellow, green, or may emit an unpleasant odor. Such symptoms could indicate an infection, such as a yeast infection or bacterial vaginosis. Additionally, hormonal imbalances or other gynecological issues may contribute to this concern [6-8].

Common indicators of leukorrhea consist of:

1) Elevated vaginal discharge
2) Unusual odor
3) Itching or irritation
4) Discomfort
5) Burning sensation during urination
6) Redness or swelling of the vulva or vagina
7) Pain in the lower abdomen
8) Offensive smell
9) Swelling

Causes of Leukorrhea:

- Unhealthy diet
- Psychological stress
- Inadequate genital hygiene
- Hormonal fluctuations during:
  a) Adolescence
  b) Menstrual period
  c) Gestation
  d) Sexual intercourse
  e) Hormonal contraceptives.
  f) Hormonal variations (excess estrogen).
  g) Sexually transmitted diseases such as trichomoniasis, chlamydia, or gonorrhea.
  - Irritants (strong soaps, douches, scented products).
  - Infections such as:
    a) Bacterial vaginosis.
    b) Yeast infections.
    c) Fungal infections (e.g., Candida albicans).
    d) Protozoan infections (e.g., Trichomoniasis).
  - Foreign objects (such as retained tampons).
  - Parasitic infestations.

Herbal Management and Treatment

1. Neem [9-10]

Synonyms: Neem, Margosa, Indian Lilac, Namba, Nim tree

Biological source: It consists of the dried or fresh leaves of *Azadirachta indica.*

Family: Meliaceae

Chemical constituents: The composition includes nimbin, Nimbidin, Nimbolide, Gedunin, and Quercetin, in addition to various tetranortriterpenoids and flavonoids. These substances are known to alleviate inflammation and enhance overall vaginal health. Nimbolide is recognized for its potent antimicrobial properties, especially effective against fungal and bacterial infections. It aids in eliminating the causative agents of leukorrhea. Both Nimbin and Nimbidin exhibit significant anti-inflammatory and antimicrobial effects, which can assist in reducing inflammation associated with leukorrhea. Gedunin is characterized by its anti-inflammatory and antifungal attributes, which may be beneficial in alleviating the symptoms of leukorrhea. Quercetin, a flavonoid, possesses antioxidant and anti-inflammatory properties. It contributes to the protection against cellular damage and aids in diminishing inflammation in the vaginal region. Additional tetranortriterpenoid compounds such as Azadiradione, Salannin, and Nimbinene also exhibit antimicrobial and anti-inflammatory characteristics, which can enhance vaginal health.

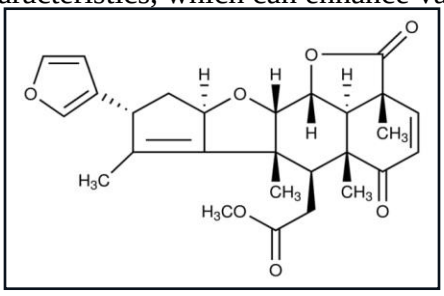

Figure 1 Plant and Major Chemical Component Of Neem

Use of Neem in leukorrhea:

- Neem extract is effective against various bacteria and fungi that are commonly associated with vaginal infections leading to leukorrhea.
- The leaves of Neem also assist in alleviating abdominal pain that may occur in cases of leukorrhea.
- Neem oil can serve as a natural remedy for vaginal discharge due to its anti-fungal and anti-inflammatory properties.
- Additionally, Neem can facilitate tissue healing, which is advantageous in situations where leukorrhea has resulted in irritation and damage to the vaginal lining.
- A cooled solution of Neem, prepared after boiling, is also utilized for vaginal washes and douches, which can help reduce inflammation and inhibit the growth of pathogens responsible for leukorrhea.

2. Triphala [11-12]

Synonyms: Phalatrika, Phalatraya, Vara, Sreshta, Tridoshahara, Amalakyadi, Parushkadi.

Biological source: This substance is obtained from the desiccated fruits of three botanical species: Emblica officinalis (commonly referred to as Indian Gooseberry or Amla), Terminalia bellirica (known as Bibhitaki), and Terminalia chebula (referred to as Haritaki).

Family:-

- Emblica officinalis:- Euphorbiaceae.
- Terminalia bellirica:- Combretaceae.
- Terminalia chebula:- Combretaceae.

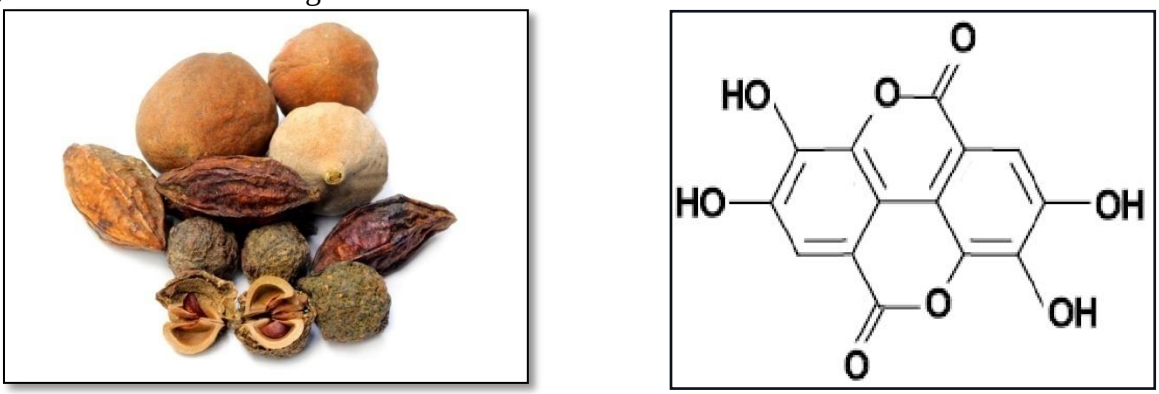

Figure 2 Fruits And Major Chemical Component Of Triphala

Chemical constituents: Theformulation encompasses a diverse array of bioactive compounds, such as tannins, gallic acid, ellagic acid, chebulinic acid, Bellericanin, Beta-sitosterol, and flavonoids. Triphala is abundant in tannins, which include both condensed and hydrolysable varieties. Gallic acid a phenolic acid recognized for its antioxidant and anti-inflammatory properties, which assist in alleviating irritation and inflammation in the vaginal region. Ellagic acid may aid in safeguarding vaginal tissues from damage inflicted by free radicals and inflammation. Chebulinic acid present in triphala exhibits antimicrobial activity, contributing to the fight against infections that may be beneficial in cases of leukorrhea. Bellericanin possess anti-inflammatory and antimicrobial properties that can assist in diminishing vaginal inflammation. Beta-sitosterol a plant sterol with potential anti-inflammatory and immunomodulatory effects helps in regulating the immune response within the vaginal area. Flavonoids exhibit anti-inflammatory, antioxidant, and antimicrobial characteristics, which may help protect vaginal tissue in instances of leukorrhea.

Uses of Triphala in leukorrhea:

- This is a conventional Ayurvedic herbal preparation utilized in the treatment of leukorrhea.
- Triphala exhibits extensive anti-microbial, anti-bacterial, and anti-fungal properties against the infections responsible for leukorrhea.

- It aids in reestablishing the natural equilibrium of microorganisms in the vaginal region.
- Occasionally, a decoction of Triphala is employed to cleanse and address issues in the vaginal area.

3. Turmeric [13-14]

Synonyms: Curcuma, *Curcuma longa*, Haldi, Curcuma domestica, Indian saffron

Biological Source: It consist of dried rhizomes of *Curcuma longa*

Family: Zingiberaceae

Chemical Constituents: Turmeric is composed of curcuminoids, sesquiterpenes, and volatile oils. Additionally, it includes demethoxycurcumin and bisdemethoxycurcumin. Curcumin is the most recognized curcuminoid. It serves as a powerful antioxidant and anti-inflammatory agent, aiding in the reduction of inflammation within the vaginal lining. Additionally, it reduces the inflammation in the vaginal region. Essential oils possess antimicrobial and antioxidant characteristics, which can assist in combating infections that may lead to leukorrhea.

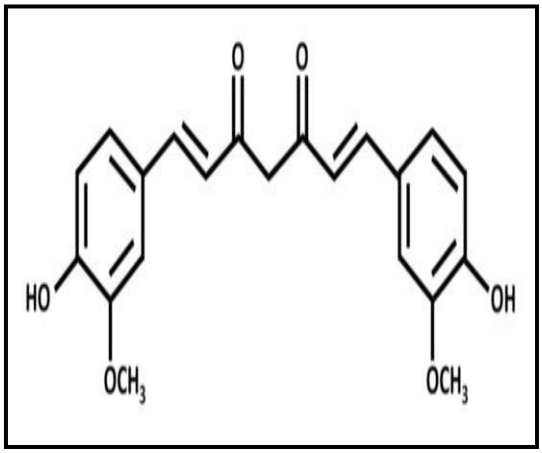

Figure 3 Rhizomes And Major Chemical Component Of Turmeric

Uses of Turmeric:

- The intake of turmeric milk or the use of turmeric paste on the vaginal region may assist in controlling white discharge.
- Additionally, turmeric is utilized to enhance blood circulation in the pelvic area.

4. Shatavari [15-16]

Biological source: It is dried tuberous roots of the plant *Asparagus racemosus*

Family: Asparagaceae

Chemical constituents: It contains steroidal saponins, Asparagine flavonoids and other compounds. It also includes mucilage and alkaloids. Steroidal saponins presnt in shatavari helps to regulates hormonal imbalance , which also helps in prevention of Leukorrhea

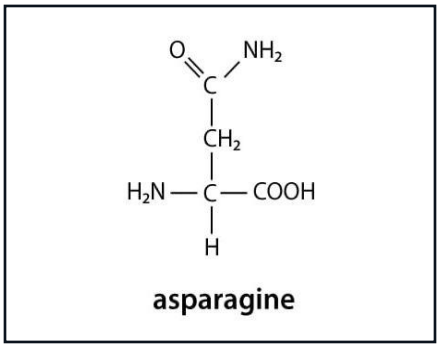

Figure 4 Plant And Major Chemical Component of Shatavari

Uses of Shatavari:

- Shatavari help to regulate the mensural cycle.
- It helps to decrease the problem of white discharge.
- It helps to increase the tone of the uterus.

5. Fenugreek Seeds [17-18]

Biological Source: It consist of dried seeds of the plant *Trigonella foenum-graecum.*

Family: Leguminosae

Chemical Constituent: It includes saponins,flavonoids alkaloids and steroidal sapogenins . Saponins has anti-inflammatory and anti microbial properties and help to manage the infections which can contribute to leucorrhea. Alkaloid like trigonelline is the important constituent of the fenugreek. It helps to reduce the swelling of the vagina. Steroidal sapongenins like diosgenin play important role in balancing hormonal levels which help to decrease the cause of leukorrhea.

Uses of Fenugreek seeds :

1. Boiled fenugreek seeds in water may help to reduce the white discharge.
2. Fenugreek also has anti-inflammatory properties that help to reduce inflammation in the vagina.
3. It also heals the vaginal tissues which can further decrease the vaginal discomfort and discharge.

Pharmacoeconomical Perspectives of Commercial Formulations for Leukorrhea

In the current circumstances the medication has got the greater value in overcoming the disease conditions. These medications can be from the different medication systems such as allopathic, homeopathic, unani, ayurvedic or any other alternate system. In this regards selecting the best medication for treatment and management of diseases is of prime importance. However, the economical factor is one of the major criteria for the selection of medication and therapy. Affordability and ease of availability is also considered by the majority of population for the selection of treatment.

Table 1 Represents Current Medications Available For Treatment Of Leukorrhea[19-20]

S. No.	Product Name	Formulation Type	Mode of action
1.	Cefixime	Tablet	Inhibition of bacterial cell wall synthesis through its binding to penicillin -binding proteins.
2.	Metronidazole	Tablet	Inhibition protein synthesis by intracting with dna
3.	Clindamycin	Intra-vaginal suppositories	Prevents Peptides Bond Formation, Inhibition Of 50s Ribosomal Unit.
4.	Doxycycline	Capsule	Inhibit the bacterial protein synthesis by allosterically binding to the 30 s prokaryotic ribosomal subunit.
5.	Fluconazole	Capsule	Fluconazole interacts with 14-demethylase, cytochrome p-450 enzyme responsible for catalyzing the conversion of lanosterol to ergosterol.
6.	Tinidazole	Tablet	The nitro group of tinidazole is reduced by cell extracts of trichomes.
7.	Lukol [Himalaya]	Tablet	Maintain the normal composition of gi flora, supporting overall vaginal health. It also improves the blood circulation and strengthen the uterine musculature.
8.	Chandraprabhavati [Patanjali]	Tablet	It helps to prevent the toxins and remove them through urine by increasing the urine flow
9.	Pradsudha	Syrup	Helps to regulate the menstrual flow, reduce pain and restore hormonal balance.
10.	V-wash	Solution	It Gently Cleansing The External Intimate area To Maintain Its Natural, Acidic PH Level Of 3.5,Which Is Maintained By Lactic Acid And Promotes Healthy Lactobacilli To Prevent Infections, Dryness And Itching .

These formulation types have different mechanism of action in the treatment of this ailment. But still the value goes to the economical aspects of the formulations. The better patient compliance is being achieved through the better results in the treatment. However, the commercial value and its utilization in the market depend upon the patient's ability to purchase the same without any hassle.

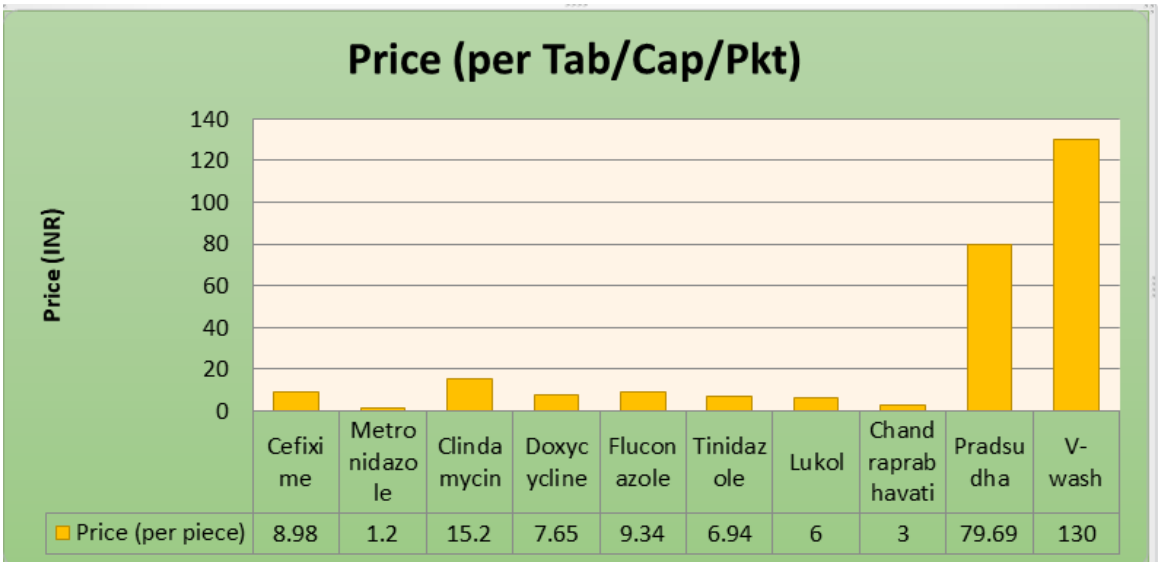

Figure 5 Represents economical prospects of the marketed medication for leukorrhea

Conclusion: The current study indicates that leukorrhea is the most common disorder among women today. It has impacted individuals of all ages and has considerably influenced their lives.Herbal treatments are regarded as some of the most effective methods for addressing and managing this condition. Furthermore, a more thorough evaluation of the economic potential of these formulations is necessary. Future research should concentrate on the pharmacoeconomic factors related to nearly all female-specific disorders.

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