

**FEMALE GENITAL TUBERCULOSIS: A NEGLECTED CAUSE OF INFERTILITY IN
DEVELOPING COUNTRIES**

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Abstract

Background: Female genital tuberculosis (FGTB) is an important form of extrapulmonary tuberculosis and a leading, yet often under recognized, cause of infertility in women of reproductive age, particularly in developing countries. The disease is frequently asymptomatic and under diagnosed due to its nonspecific clinical presentation, contributing to delays in management and poor reproductive outcomes.

Methods: This review summarizes current knowledge on the epidemiology, pathogenesis, clinical manifestations, diagnostic approaches, treatment strategies, drug resistance, and public health implications of FGTB. Data were synthesized from epidemiological studies, clinical reports, and molecular diagnostic research.

Results: FGTB primarily affects the fallopian tubes (90–100%), followed by the endometrium (50–60%) and ovaries (20–30%), with rare involvement of the cervix, vagina, or vulva. Clinical presentation ranges from infertility, menstrual irregularities, and pelvic pain to asymptomatic cases. Diagnosis requires a combination of imaging (hysterosalpingography, ultrasonography, laparoscopy), histopathology, microbiological testing (Ziehl–Neelsen staining, culture), molecular methods (PCR, gene amplification, BACTEC), and immunological tests. Standard antitubercular therapy (ATT) for 6–9 months remains the cornerstone of treatment, with surgical intervention reserved for complicated cases. Drug-resistant tuberculosis, particularly multidrug-resistant TB (MDR-TB), poses a significant therapeutic challenge. FGTB causes structural and functional damage to the reproductive tract, resulting in tubal obstruction, endometrial destruction, pelvic adhesions, and ovarian dysfunction, leading to infertility in 40–80% of affected women, often necessitating assisted reproductive techniques such as in vitro fertilization.

Conclusion: FGTB represents a significant reproductive health burden in endemic regions. Early detection through improved awareness, screening of infertile women, and use of molecular diagnostics is essential to prevent irreversible reproductive damage. Strengthening tuberculosis control programs and public health strategies is critical for reducing the incidence of this neglected cause of female infertility.

Keywords

Female genital tuberculosis, infertility, extrapulmonary tuberculosis, Mycobacterium tuberculosis, PCR, antitubercular therapy

Introduction

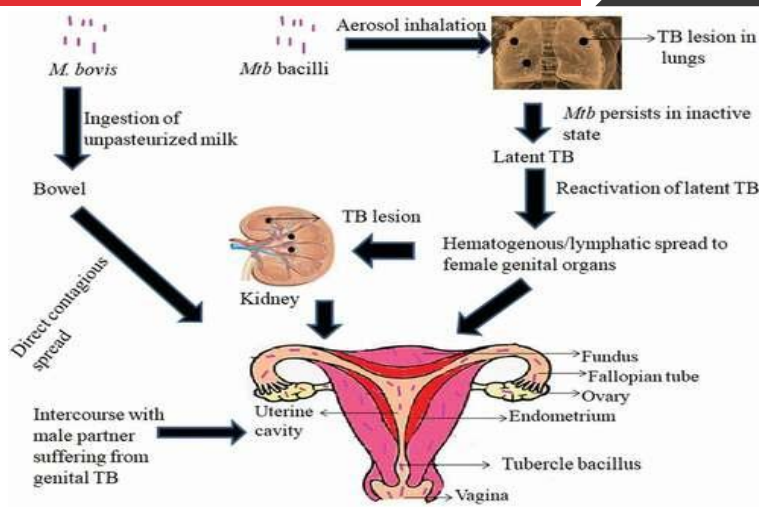
Tuberculosis (TB) remains a major global health concern despite advances in diagnosis and treatment. According to the World Health Organization (WHO), millions of new cases occur annually, with the highest burden in developing countries [2]. While pulmonary TB is the most common form, extrapulmonary TB constitutes a significant proportion of cases. Female genital tuberculosis (FGTB) is an important type of extrapulmonary TB affecting the reproductive system. It is usually secondary to a primary focus, most commonly pulmonary TB. Due to its asymptomatic or subtle presentation, FGTB is often diagnosed during infertility evaluation [1,3]. FGTB represents a major reproductive health issue in TB-endemic regions such as India, Nepal, and Central Asia [1,4].

The true incidence of female genital tuberculosis (FGTB) is difficult to determine due to under diagnosis and the often asymptomatic nature of the disease. Genitourinary tuberculosis accounts for 14–41% of extrapulmonary TB cases (1). FGTB affects approximately 3–16% of infertile women in India (3,6), while the global prevalence among infertile women is estimated at 5–10% (4). In developed countries, the prevalence is less than 1% (5). The most commonly affected age group is 20–40 years. Factors such as migration, HIV co-infection, and drug-resistant tuberculosis have contributed to the resurgence of genital TB globally (2).

Region	Estimated Prevalence	Key Findings
Developed countries	<1%	Effective TB control
Global average	5–10%	Improved detection
Asia & Africa	15–20% of EPTB	High TB burden
India	3–16%	High infertility association
Nepal	5–10%	Similar to India
Central Asia	2–8%	Emerging concern

Etiology: The primary causative organism is: *Mycobacterium tuberculosis* (90–95%) [1] and less common causes include: *Mycobacterium bovis* (5–10%), associated with unpasteurized milk. Atypical mycobacteria (rare)

Routes of spread: Hematogenous spread (most common, ~80%), Lymphatic spread, Direct spread from adjacent organs, Primary infection (rare, via sexual transmission). The fallopian tubes are almost always involved, leading to tubal obstruction and infertility [1].



Organ	Frequency
Fallopian tubes	90 – 100%
Endometrium	50 – 60%
Ovaries	20 – 30%
Cervix	5 – 15%

Clinical Manifestations

Female genital tuberculosis (FGTB) presents with variable and often nonspecific clinical features, which frequently delay diagnosis. General symptoms may include low-grade fever, weight loss, loss of appetite, and a sense of malaise. Gynecological manifestations are more prominent, with infertility being the most common presentation. Patients may also experience menstrual irregularities such as amenorrhea, dysmenorrhea, or menorrhagia. In addition, some women report pelvic pain, abnormal vaginal discharge, dyspareunia, and post-coital bleeding. Notably, a significant proportion of patients may remain asymptomatic, further complicating early detection and timely management.[4].

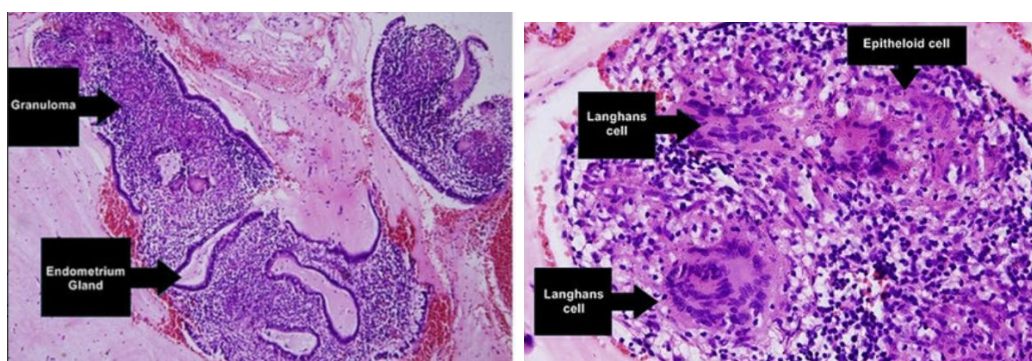
Diagnostic Methods

Diagnosis of female genital tuberculosis requires a combination of imaging and laboratory techniques due to its nonspecific presentation. Imaging studies play a crucial role in initial evaluation. Hysterosalpingography (HSG) commonly demonstrates characteristic findings such as beaded fallopian tubes, tubal obstruction, hydrosalpinx, and the classical “golf club” appearance due to distal tubal blockage. Ultrasonography may reveal adnexal masses, ascites, and endometrial calcifications, although these findings are not specific. Laparoscopy remains a valuable diagnostic tool, allowing direct visualization of tubercles, pelvic adhesions, and a frozen pelvis, and also facilitates biopsy for confirmation.



Figure: Uterus is small in size and shows irregular outline with tiny diverticulae. Irregular borders and beaded appearance noted in both the fallopian tubes with obstruction at distal isthmus portion with golf club appearance. No peritoneal spillage is seen on either side. Image features are most likely suggestive of genital tuberculosis

Laboratory diagnosis is essential for definitive confirmation. Histopathological examination of endometrial biopsy specimens may show granulomas, caseous necrosis, and Langhans giant cells, which are suggestive of tuberculosis. Microbiological methods include detection of acid-fast bacilli using Ziehl–Neelsen staining and culture on Lowenstein–Jensen medium, although culture has low sensitivity and requires prolonged time. Molecular diagnostic techniques such as polymerase chain reaction (PCR), gene amplification tests, and radiometric systems like BACTEC have significantly improved early detection due to their higher sensitivity and rapid results. Immunological tests, including the tuberculin skin test and interferon-gamma release assays, may support the diagnosis but lack specificity for genital involvement. A combination of these modalities is often required to establish an accurate diagnosis of FGTB [1,7,10].



Treatment, Drug Resistance, and Impact on Fertility

Management of female genital tuberculosis (FGTB) follows standard antitubercular therapy (ATT) guidelines recommended by the World Health Organization. The first-line treatment regimen includes Isoniazid, Rifampicin, Pyrazinamide, Ethambutol, and in selected cases Streptomycin, administered for a duration of 6–9 months depending on national protocols and patient response. Early initiation of therapy is essential to limit disease progression and prevent

irreversible reproductive damage. Surgical intervention may be required in complicated cases, particularly in the presence of tubo-ovarian masses, persistent pelvic adhesions, or a non-resolving abscess [2].

The emergence of drug-resistant tuberculosis poses a significant challenge in management. Multidrug-resistant tuberculosis (MDR-TB) is defined as resistance to at least Isoniazid and Rifampicin, the two most potent first-line drugs. Management of MDR-TB requires the use of second-line antitubercular agents, which are often less effective, more toxic, and require prolonged treatment duration, thereby increasing the burden on patients and healthcare systems [2].

FGTB has a profound impact on female fertility, primarily due to structural and functional damage to the reproductive organs. Tubal obstruction remains the most common cause, along with endometrial damage that impairs implantation, pelvic adhesions that distort pelvic anatomy, and ovarian dysfunction affecting ovulation. Studies indicate that infertility occurs in approximately 40–80% of women affected by genital tuberculosis. Even after successful completion of ATT, fertility outcomes may remain poor due to irreversible damage, and many patients may require assisted reproductive techniques such as in vitro fertilization (IVF) to achieve pregnancy [1,4].

Prevention and Public Health Importance

Prevention of female genital tuberculosis (FGTB) largely depends on effective control of tuberculosis at the community level. Early detection and prompt treatment of pulmonary tuberculosis are essential to reduce hematogenous spread to the genital tract. Screening for genital tuberculosis should be considered in women presenting with infertility, particularly in endemic regions, to enable timely diagnosis and management. Strengthening diagnostic facilities, including access to molecular techniques, can significantly improve early detection rates. In addition, increasing awareness among clinicians regarding the varied and often asymptomatic presentation of FGTB is crucial for reducing missed diagnoses. Public health measures such as strengthening national tuberculosis control programs, improving surveillance, and addressing risk factors like HIV infection and poor socioeconomic conditions play a vital role in reducing the overall burden of the disease [2,4].

Conclusion

Female genital tuberculosis is an under recognized but significant cause of infertility in developing countries. Its asymptomatic nature and diagnostic challenges contribute to delayed detection. Advances in molecular diagnostics have improved identification; however, increased clinical awareness is essential. Early diagnosis and appropriate treatment are crucial to improving reproductive outcomes.

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