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THE IMPACT OF GENITAL TUBERCULOSIS IN INFERTILITY: AN OVERVIEW

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ABSTRACT

Introduction: Genital tuberculosis (GTB) is a major cause of infertility, particularly in tuberculosis-endemic regions. It primarily affects the fallopian tubes and endometrium, leading to tubal blockage, adhesions, and endometrial damage. GTB is often asymptomatic or presents with non-specific symptoms, making diagnosis challenging. Early identification and appropriate treatment are crucial to improving reproductive outcomes. **Methods:** This retrospective observational study included 93 infertile women aged 21–30 years diagnosed with GTB at a tertiary care center. Diagnosis was based on histopathology, acid-fast bacilli (AFB) staining, culture, and polymerase chain reaction (PCR). Data on demographics, clinical presentation, diagnostic methods, and pregnancy outcomes post-antitubercular therapy (ATT) were analyzed using SPSS version 25. A p-value <0.05 was considered statistically significant. **Results:** Primary infertility was present in 78.5% of cases. Common symptoms included menstrual irregularities (65.6%) and chronic pelvic pain (58.1%). PCR had the highest sensitivity (72%), while TB culture (22.6%) and ZN staining (16.1%) had lower detection rates. Post-ATT follow-up showed a pregnancy rate of 32.2%, with 19.3% conceiving naturally and 12.9% through assisted reproductive technologies. Per vaginal examination abnormalities were noted in 69.9% of cases. **Discussion:** GTB remains a significant but underdiagnosed cause of infertility. The disease primarily affects the reproductive years and is often asymptomatic. PCR was the most effective diagnostic tool. Despite ATT, pregnancy outcomes were suboptimal, highlighting the need for early detection and intervention. **Conclusion:** GTB significantly impacts female fertility. Early diagnosis, multimodal diagnostic approaches, and assisted reproductive technologies are necessary to improve pregnancy outcomes in affected women.

INTRODUCTION

Genital tuberculosis (GTB) is a significant cause of infertility, particularly in developing countries where tuberculosis (TB) is endemic. It is a form of extrapulmonary tuberculosis that affects the female genital tract, including the fallopian tubes, endometrium, ovaries, and cervix. GTB often remains asymptomatic or presents with non-specific symptoms, making it a challenging diagnosis. The disease is a major contributor to tubal factor infertility, which is the most common cause of infertility in women from TB-endemic regions. Genital tuberculosis is still a prevalent health issue that contributes to infertility in areas that are deemed non-endemic, which suggests that the condition is underestimated and thus ignored.[1]

The pathogenesis of GTB involves the hematogenous spread of Mycobacterium tuberculosis from a primary focus, usually the lungs, to the genital tract. The fallopian tubes are the most commonly affected site, followed by the endometrium. The inflammatory response to the infection leads to fibrosis, adhesions and tubal blockage, which can result in infertility. In some cases, GTB can also cause menstrual irregularities, chronic pelvic pain, and pelvic inflammatory disease. Infertility in GTB results from tubal obstruction, endometrial damage, ovarian dysfunction, and pelvic adhesions.[2,3] The fallopian tubes are the most commonly affected site, with tubal blockage leading to infertility in nearly 90% of cases. Endometrial involvement may result in Asherman's syndrome (intrauterine adhesions), impairing implantation and pregnancy outcomes.[4]

The diagnosis of GTB is often delayed due to its insidious onset and the lack of specific symptoms. Conventional diagnostic methods include histopathological examination, acid-fast bacilli (AFB) staining, culture, and polymerase chain reaction (PCR). However, these methods have varying sensitivities and specificities, and a combination of techniques is often required for an accurate diagnosis. Since there are

numerous signs of genital TB, including adhesions, caseation, etc., diagnostic laparoscopy is still the gold standard for diagnosing genital TB and is readily visible during laparoscopy and a biopsy from a representative region may even be obtained for histopathological analysis.[5] According to Sharma et al, hysterosalpingography (HSG) continues to be the first diagnostic method used to evaluate tubal factor infertility in low-income nations due to its accessibility.[6]

The treatment of GTB involves a prolonged course of antitubercular therapy (ATT), which can last from 6 to 9 months. Despite adequate treatment, the reproductive outcomes in women with GTB-related infertility are often poor due to the irreversible damage caused by the disease. The pregnancy rate after ATT is low, and many women require assisted reproductive technologies (ART) to achieve conception.

The impact of GTB on infertility is profound, particularly in low-resource settings where access to diagnostic and treatment facilities is limited. Early diagnosis and prompt treatment are crucial to improving reproductive outcomes in affected women.

This study aims to evaluate the clinical presentation, diagnostic methods, and treatment outcomes of GTB in infertile women, with a focus on the correlation between ATT and pregnancy rates.

METHODS

Data Collection

Data for this study were collected from a cohort of 93 infertile women diagnosed with GTB at a tertiary care center over a period of two years. The diagnosis of GTB was based on a combination of clinical findings, histopathological examination, AFB staining, culture, and PCR. Demographic data, including age, parity, and duration of infertility, were recorded. Clinical symptoms such as menstrual irregularities, pelvic pain, and vaginal discharge were documented.

Study Design

This was a retrospective observational study. The inclusion criteria were women aged 21 to 30 years with a diagnosis of GTB and infertility. The study was approved by the institutional ethics committee, and informed consent was obtained from all participants.

Inclusion Criteria

- Women aged 21-30 years.
- Diagnosis of GTB based on histopathology, AFB staining, culture, or PCR.
- Primary or secondary infertility.

Exclusion Criteria

- Other causes of infertility (e.g., male factor, ovarian dysfunction).
- Previous history of ATT.
- Active pulmonary or extrapulmonary TB outside the genital tract.

Statistical Analysis

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as percentages. A p-value of <0.05 was considered statistically significant. Pregnancy outcomes post-ATT were assessed.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the institutional review board, and written informed consent was obtained from all participants. Confidentiality of patient data was maintained throughout the study.

OBSERVATIONS AND RESULTS

The majority of women in the study (51.6%) were in the 26–30 years age group, while 48.4% were aged 21–25 years. Primary infertility was more common (78.5%) compared to secondary infertility (21.5%). The duration of infertility was 3–5 years in most cases (45.2%), followed by <3 years (37.6%) and >5 years (17.2%).

Table 1: Demographic Data.

Demographic Variable	Number of Cases (n)	Percentage (%)
Age Group (Years)		
21-25	45	48.4
26-30	48	51.6
Type of Infertility		
Primary Infertility	73	78.5
Secondary Infertility	20	21.5
Duration of Infertility		
< 3 Years	35	37.6
3-5 Years	42	45.2
> 5 Years	16	17.2

Menstrual irregularities were the most common symptom, affecting 65.6% of women, followed by chronic pelvic pain in 58.1% of cases. Vaginal discharge was reported in 42.0%, while 34.4% of women were asymptomatic, highlighting the silent nature of genital tuberculosis. Systemic symptoms like weight loss (19.4%) and fever (12.9%) were less frequently observed compared to gynecological symptoms.

Table 2: Distribution of Associated Signs and Symptoms.

Symptom	Number of Cases (n)	Percentage (%)
Menstrual Irregularities	61	65.6
Chronic Pelvic Pain	54	58.1
Vaginal Discharge	39	42.0
Asymptomatic	32	34.4
Dyspareunia (Painful Intercourse)	25	26.9
Weight Loss	18	19.4
Fever	12	12.9

PCR for TB had the highest sensitivity (72%), making it the most effective diagnostic method, while ZN staining (16.1%) and TB culture (22.6%) had lower detection rates.

Table 3: Comparison of Diagnostic Yield of Different Methods .

Diagnostic Test	Positive Cases	Sensitivity (%)
ZN Staining	15	16.1%
TB Culture	21	22.6%
PCR for TB	67	72%
Histopathology	43	46.2%
Laparoscopy/Hysteroscopy	59	63.4%

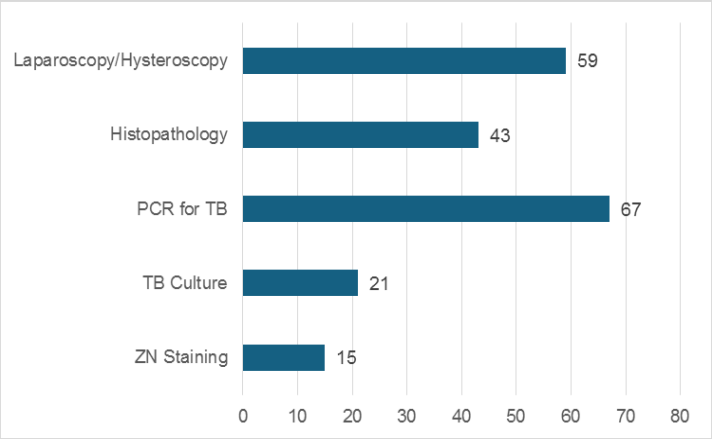

Figure 1: Bar chart of Different Diagnostic Tests taken.

Post-ATT follow-up showed that 32.2% of women conceived, with 19.3% naturally and 12.9% through ART, while 67.7% remained infertile, indicating persistent reproductive challenges despite treatment.

Table 4: Correlation of ATT and Pregnancy Rate on Follow-Up.

Post-ATT Follow-up (12–24 months)	No of Patients	Percentage
Conceived Naturally	18	19.3%
Conceived with ART	12	12.9%
No Conception	63	67.7%

Per vaginal examination revealed abnormalities in 69.9% of cases, with nodularity in the cul-de-sac (26.9%) and fornical tenderness (25.8%) being common signs of genital TB.

Table 5: Findings in Per Vaginal Examination.

Findings	No of Patients	Percentage
Normal	28	30.1%
Fornical Tenderness	24	25.8%
Fixed Retroverted Uterus	16	17.2%
Nodularity in Cul-de-sac	25	26.9%

Grading of tubercle bacilli showed that 83.9% of cases were negative on staining, reinforcing the need for more sensitive molecular and histopathological diagnostic methods.

Table 6: Grading of Tubercle Bacilli on Staining.

Grade	Number of Cases (n)	Percentage (%)
1+ (Scanty Bacilli)	8	8.6%
2+ (Moderate Bacilli)	4	4.3%
3+(Abundant Bacilli)	3	3.2%
Negative	78	83.9%

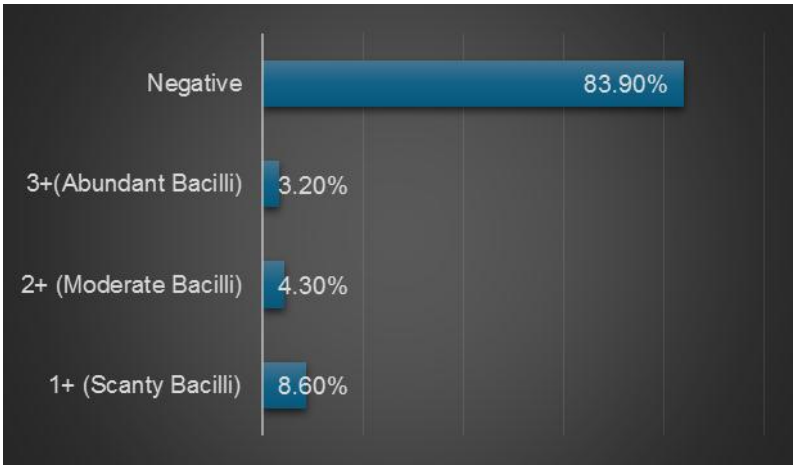

Figure 2: Bar Chart showing Grading of Tubercle Bacilli on Staining.

DISCUSSION

The majority of participants (51.6%) were in the age group 26 to 30, while others were between 21–25 years. This aligns with the well-documented evidence that GTB primarily affects women in their reproductive years, contributing significantly to infertility. The patients in the Namahar et al. study were 30.4 years old on average when they were diagnosed[7] and Seven patients (17.07 %) complained of pelvic or abdominal pain. In our present study, the high prevalence of primary infertility (78.5%) compared to secondary infertility (21.5%) underscores the severe reproductive implications of GTB, often diagnosed when women fail to conceive despite years of attempting.

The duration of infertility varied, with 45.2% of women experiencing infertility for 3–5 years**,** followed by 37.6% with infertility for less than 3 years, and 17.2% with infertility for over 5 years. The prolonged duration of infertility before diagnosis suggests a delay in recognizing and treating GTB, potentially leading to irreversible reproductive damage.

In this study, menstrual irregularities (65.6%) were the most common symptom, consistent with previous research linking GTB to endometrial damage and hormonal dysfunction. Chronic pelvic pain (58.1%) was the second most reported symptom, followed by vaginal discharge (42.0%) and dyspareunia (26.9%)**.** A significant proportion of women **(**34.4%**)** were asymptomatic, which is concerning, as it indicates that many cases remain undiagnosed until infertility becomes apparent. Our study is consistent with the study by Sughra et al[8] where infertility was their chief complaint, however, patients presented different symptoms including lower abdominal pain, menstrual disorder (n=5, 16.7%), Leukorrhea (vaginal discharge) in 3 patients , pelvic mass , weight disturbances. But in our study, systemic symptoms like weight loss (19.4%) and fever (12.9%) were less commonly reported, reinforcing the notion that GTB often lacks classical tuberculosis symptoms and primarily manifests through reproductive dysfunction. Whereas, Qureshi et al[9] in his study reported that Infertility and abdominal pain were the most frequently reported presenting symptoms. Fever, ascites, irregular vaginal bleeding, oligomenorrhea, chest pain, and flank pain were among the other symptoms.

PCR for TB had the highest sensitivity, making it the most reliable method for detecting Mycobacterium tuberculosis in genital tissues. This finding aligns with prior studies demonstrating PCR's superior detection rates, especially in cases with low bacterial load. Laparoscopy and hysteroscopy (63.4%) proved useful in detecting tubal and peritoneal involvement, supporting their role in diagnosing GTB-related infertility. Histopathology (46.2%) showed moderate sensitivity, suggesting its utility in combination with other diagnostic methods. TB culture (22.6%) and ZN staining (16.1%) had the lowest sensitivity, reflecting the difficulty in isolating Mycobacterium tuberculosis from genital specimens due to the paucibacillary nature of GTB. In a study conducted by Kulshrestha et al[10], EA PCR was positive in 41.3% of cases, PW PCR was positive in 71.6 percent of cases, and a small percentage of the remaining laboratory tests were positive.

Findings from per vaginal examination showed abnormalities in 69.9% of cases**,** with nodularity in the cul-de-sac (26.9%) and fornical tenderness (25.8%) being common signs of GTB. These findings correlate with laparoscopic evidence of pelvic adhesions**,**

reinforcing the role of clinical examination in diagnosing GTB. In a study by Bhanu et al[11], the researchers compared the sensitivity and specificity of PCR with conventional diagnostic methods, such as acid-fast bacilli (AFB) staining, culture, and histopathology. They found that PCR had a significantly higher sensitivity (82.6%) compared to AFB staining (8.7%) and culture (21.7%), making it a more reliable tool for diagnosing genital TB.

Grading of tubercle bacilli revealed that 83.9% of cases were negative on staining, highlighting the low bacterial load in genital TB and the need for molecular and histopathological methods for accurate diagnosis.

The study by Aliyu et al.[12] highlighted that FGTB is a significant but often underdiagnosed cause of infertility, particularly in developing countries with high tuberculosis (TB) prevalence. The study also emphasized the nonspecific and subtle nature of symptoms, such as pelvic pain, menstrual irregularities, and amenorrhea, which often delay diagnosis and suggested that early initiation of anti-tubercular therapy (ATT) can help mitigate complications, though it may not restore fertility in cases of extensive reproductive tract damage.

CONCLUSION

- High prevalence in reproductive-aged women (21–30 years), with primary infertility being the most common presentation.
- Menstrual irregularities and chronic pelvic pain are key clinical indicators, but a large proportion of cases remain asymptomatic.
- PCR for TB is the most sensitive diagnostic test, reinforcing its role in diagnosing GTB.
- Despite ATT, pregnancy rates remain low, with a significant number of women requiring ART for conception.
- Early diagnosis and multimodal treatment approaches are crucial in preserving fertility and improving reproductive outcomes in women with GTB

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