

A Study of Mycobacterium Tuberculosis Infection in Women with Infertility

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Abstract:

Introduction: Pulmonary tuberculosis is the most prevalent presentation; extra pulmonary and genital tuberculosis were the second most common presentations, with an increase in women of reproductive age.

Aim: The purpose of this study was to look for mycobacterium tuberculosis in endometrial biopsy samples from infertile women.

Methods: In a cross-sectional investigation, 36 infertile women aged 21-35 years were tested for mycobacterium tuberculosis infection in endometrial biopsy using PCR technology.

Results: Upon PCR procedure, all cases were negative, which show that there was no genital tuberculosis infection in any of the women with infertility.

Conclusion: In our investigation, genital TB did not appear to be a serious issue in women experiencing infertility.

Keywords: Infertility, Polymerase chain reaction, Genital mycobacterium tuberculosis.

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Introduction

Infertility rates vary by country, ranging between 5 and 20%. [1] Female infertility can be caused by a variety of causes, including ovulation problems, vaginal area infections, uterine problems, tubal obstruction, endometriosis, endocrine abnormalities, pelvic infections, and so on. Females with unexplained infertility do not have a clear etiology. [2,3]

Tuberculosis has the highest fatality rate of any infectious illness, killing 1.5 million people in 2018 and infecting 10 million individuals per year, resulting in 1.33 million fatalities. [4] Infertility, menstrual issues, unexplained stomach pain, and a pelvic lump are all symptoms of genital tuberculosis. Patients present with fever, weight loss, and nocturnal sweats as systemic signs. Female genital TB is still a major cause of tubal obstruction and infertility, especially in developing countries. It affects the vaginal organs, causing irregular menstruation and infertility. Genitourinary TB affects 5-10% of infertile females globally. Genitourinary tuberculosis primarily affects young women aged 20 to 40 years. In India, 3% of infertile women have Genitourinary TB, and 41% have tubal factor infertility. [5] Mani et al. (2003) discovered that the Ziehl-Neelsen stain (28), can be used to

diagnose genitourinary TB. By culture, Biswas et al. in suspected genital mycobacterium tuberculosis. [6]

According to Abebe et al., 4% of clinically suspected patients with genitourinary tuberculosis were positive by AFB staining, 12% by culture, and 28% by histology, with PCR providing the highest detection rate of 48%. [7,8] The pathogen spreads to the fallopian tubes (92-100% of cases), endometrium (50% of cases), ovaries (10-30% of cases), cervix (5% of cases), vagina, and vulva (1% of cases), resulting in chronic lower abdominal or pelvic pain, vaginal bleeding, menstrual irregularity, general malaise, and infertility. When mycobacterium tuberculosis affects the female genital organs, it causes irreparable damage to the fallopian tube, resulting in infertility. [9,10]

Hence, genitourinary TB not only causes tubal dysfunction and blockage, but also affects implantation due to endometrial involvement and ovulatory failure due to ovarian involvement.

To arrive at a diagnosis, a comprehensive physical examination, meticulous history taking, and judicious utilization of testing are performed. Hysterosalpingography is the most accurate way for detecting genitourinary TB and the gold standard screening test for tubal infertility.

Routine laboratory examinations for genitourinary tuberculosis diagnosis include chest X-ray, Hysterosalpingography, and tuberculin test, sacculatation, sinus formation, and a rigid "pipestem" pattern of the fallopian tubes, histological examination by acid-fast stain, and culture of biopsies from laparoscopy or endometrial curettage. Laparoscopy is a valuable procedure for obtaining tissue for histological analysis for mycobacterial culture and PCR.

Materials and methods: This study was carried out at the OBG department of the Nimra Institute of Medical Sciences in Vijayawada. Infertile women aged 21 to 35 years with normal Hysterosalpingograms were included. The study included 36 infertile women. Patients having a history of endocrine problems, PCOS, and TB were excluded. The study duration from June 2021 through May 2023.

Hysteroscopy was performed to determine the status of the fallopian tubes, the presence of cornual or fimbrial block, tubal beading, tubercles, tuboovarian masses, peritubal, periovarian adhesions, rigid tubes, fimbrial phimosis, hydrosalpinx, bowel, omental adhesions, intrauterine adhesions, small uterine cavity, and fibrosed ostia. Finally, 36 women with normal hysterosalpingograms and follicle-stimulating hormone levels of 10 IU/ml were included and evaluated for MTB detection in endometrial biopsy by PCR.

Sample collection: Under aseptic conditions, endometrial biopsy/curettage samples were collected during the late follicular phase of menstruation. During the laparoscopy, 20 ml of fluid

sucked from the Douglas pouch or recovered after washing was collected into tubes for culture and PCR.

PCR technique

DNA extraction from endometrial tissue samples performed according to manufacturer's instructions. Endometrial DNA samples were tested for Mycobacterium tuberculosis using RT-PCR. PCR reactions were carried out using the diagnostic kit MTb Complex qualitative Real time PCR according to the manufacturer's instructions (Geno Sen's® MTb Complex /MOTT RG qualitative, Genome Diagnostics Pvt. Ltd, New Delhi, India).

Positive and negative controls, as well as PCR-grade water, were included. The output of the automated Real Time PCR was evaluated for PCR-positive and PCR-negative results.

Statistical analysis

The acquired data was processed in MS Excel 2019 and analyzed using Microsoft Excel and the statistical program SPSS version 24.0 (SPSS Inc., Chicago, Illinois, USA). The Chi square test was used to determine the significance of a discrepancy in proportions. P value 0.05 was judged statistically significant.

Results

The mean (SD) age of all participants was 28.95 ± 5.62 years. It was not identified any cases with MTB DNA in endometrial specimens PCR results, and it was shows that there was no Genitourinary tuberculosis infection in the biopsies.

Table 1: Demographic characteristics of women with infertility

Variable	Category	Frequency, n (%)	P value
Age (yrs)	21–25	8(22.22%)	0.352
	26–30	15 (41.6%)	
	31–35	13(36.2%)	
Living place	Urban	27 (75%)	0.095
	Rural	9 (25%)	
Educational level	Illiterate	3(8.33)	0.725
	Elementary	8(22.22)	
	High School	16(44.44)	
	college/university	9(25%)	
Occupation	House maker	13(36.12%)	0.0768
	Worker	7(19.45%)	
	Employees and teachers	16(44.44%)	

Table 2: Clinical and biochemical characteristics of women with infertility

Variable	Means \pm SD
Age (yrs)	28.95 ± 5.62
Duration of Infertility (year)	4.65 ± 2.89
Levels pf Follicle-stimulating hormone (IU/ml)	8.35 ± 0.8

Discussion

It is critical to investigate other disorders that have symptoms similar to Genitourinary TB, such as pelvic inflammatory disease, ectopic conception, and ovarian cysts.

The majority of instances of genital TB have been reported in fertile people between the ages of 20 and 45. In our study, the average age of infertile women was 28.95 years.

The fallopian tubes are the main site of genitourinary TB. The tubes are thicker and have a rough exterior surface with adhesions. Caseous ulceration of the mucosa results in ragged contours and diverticular outpouchings of the isthmus and ampulla. [12] the most common location for tube obstruction is the transition zone between the isthmus and the ampulla. Hydrosalpinx is a common finding in genitourinary TB. [13,14] Hatami et al reported 52 instances of genital TB, 27 cases of infertility (52%) and 70% of cases with open fallopian tubes. [15]

Endometrial MTB has been reported to have a generic appearance on Hysterosalpingogram, was characterized by synechiae, a deformed uterine contour, and venous and lymphatic intravasation, but they were not observed in our investigation.

Early identification of genital TB is critical because once the infection has destroyed the tubes; restoring tubal patency is extremely difficult. The prognosis for fertility is quite bad in women with tubal and intrauterine adhesions caused by genital TB, since the fallopian tubes are frequently closed and scarring of the endometrial cavity compromises the results of in vitro fertilization and embryo transfer. Conventional procedures (smear & culture) are regarded the gold standard for genital tuberculosis diagnosis, although histopathology has a low efficacy, particularly in paucibacillary endometrial MTB.

PCR is used to detect mycobacterial DNA in endometrial samples from probable tuberculosis patients. It is a quick, sensitive, and specific molecular approach. [15] Based on current knowledge that laparoscopy is a valuable tool for diagnosing tubal infertility and genital tuberculosis, and that PCR is very sensitive for detecting mycobacterial infection, the diagnosis of genital tuberculosis in suspicious cases was made using diagnostic laparoscopy and Hysterosalpingogram findings in our study. To avoid missing cases, amplification of DNA MTB in endometrial specimens using PCR method was performed in all negative patients on laparoscopy and hysterosalpingogram. In our study, diagnostic Hysterosalpingogram and laparoscopy were employed to screen for genital tuberculosis probable cases with aberrant tubal or uterine symptoms, and endometrial tissue aspiration. There were no occurrences of positive PCR; however, in another study, there were 8 PCR positive cases among 35

endoscopically normal individuals, while 91 patients with endoscopic characteristics suggestive of genital tuberculosis did not have positive TB PCR. [16]

Conclusion

This study investigated 36 infertile women with no signs of tubal or endometrial involvement and found no cases of positive MTB infection in biopsies using the PCR technique. As a result, GTB could not be regarded a substantial factor in women with unexplained infertility at the outstation.

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