Comparison of diagnostic efficacy of USG, Tuberculin test, Nucleic acid amplification test (PCR) & histopathology for diagnosis of genital tuberculosis in infertile women, assuming culture as gold standard

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Abstract— *Female genital tuberculosis is one of the major etiological factors of female infertility. Diagnosis of genital tuberculosis is very important in such cases. So this comparative observational type of study was carried out on infertile women to compare the diagnostic effectively of ultrasonograpgy (USG), genital tuberculosis, Tuberculin test, Nucleic acid amplification test (PCR), histopathology and hysteroscopy & laparoscopy (DHL) assuming culture as gold standard. It was observed that the 28% of infertile cases were found positive for genital tuberculosis on culture. Sensitivity of PCR 64.28%, DHL 92.85%, USG 42.85%, Histopathology 60.71% and Tuberculin Test 64.28%. So sensitivity was found with significant variation ranging from 42.85% with ultrasonography (USG) to 92.85% with DHL. Specificity of PCR 52.77%, DHL 55.55%, USG 98.61%, Histopathology 91.66% and Tuberculin Test 36.11%. So specificity was also found with significant variation being found maximum with USG (98.61%) and minimum with tuberculin test (36.11%). Positive predictive value (PPV) was found maximum (92.3%) with USG and minimum (28.12%) with tuberculin test and negative predictive value (NPV) was found maximum (95.23%) with DHL and minimum (72.22%) with tuberculin test. Diagnostic effectively of diagnosing GTB with various studied modalities vary with significant variation.*

Keywords: Infertility, diagnostic efficacy, genital tuberculosis, Tuberculin test, Nucleic acid amplification test (PCR).

I. INTRODUCTION

Infertility is defined as inability of a couple to conceive even after 1 year of unprotected and regular intercourse.[1] Various Indian studies have shown that tuberculosis endometritis and salpingitis account for 4-9 per cent of all infertility cases.[2] Female genital tuberculosis is 10-15 times more common in developing countries.[3] Prevalence of genital tuberculosis worldwide is between 5% and 10%, while in India it is 19%.[4]

Female genital tuberculosis is one of the major etiological factors of female infertility. It has been estimated that approximately 5 – 10 % of females presenting to subfertility clinics worldwide have genital TB.[5] Prevalence of genital tuberculosis is much higher than one might imagine, as based on lack of report available in the literature, it may account for significant amount of female infertility.[6] Genital TB may be asymptomatic and diagnosis requires a high index of suspicion.

A definite microbiolgical diagnosis of genital tuberculosis is difficult to establish before administration of anti tuberculosis treatment, which often needs to be started on a probable or presumptive diagnosis. Therefore it was decided to compare the effectiveness of various diagnostic modalities to diagnose tuberculosis in infertile women.

II. METHODOLOGY

This comparative observational type of study was carried out on infertile women in Gynecology and Obstetrics department of SMS Medical College, Jaipur (Rajasthan) India, in year 2017.

Sample size calculated at 95% confidence level assuming concordance of 42.52% results between endoscopic diagnosis of tuberculosis & PCR results as per the study of Asha Baxi et al.[7] At the precision (Relative allowable error) of 10, 94 patients of infertility are required as sample size which is rounded off to 100 patients as final sample size.

So subjects were selected from all 20 years to 35 years aged infertile women attending the Gynecology OPD of Department of Obstetrics and Gynaecolgy in SMS Medical College, Jaipur and willing to participate in the study. Women who refuse to give written inform consent was excluded from study. Women who had either acute PID, or immuno-comprosised state and or laparoscopy contraindicated were also excluded from the study. Finally this study was conducted on 100 infertile eligible women.

Every eligible infertile couple was included in the study after taking preliminary details; routine work-up for female infertility was done. Study group was undergo Complete haemogram, Ultrasonography, Culture by BACTEC Radiometric System, Tuberculin Test, Histopathological (EB) examination, Hysteroscopy, TB PCR (Endometrial Biopsy, menstrual blood & Paouch Of Douglas fluid) and Laproscopy.

Statistical analysis: Since the data thus obtained were processed in MS Excel 2010 worksheet. Sensitivity, Specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of the various diagnostic modalities were calculated. These sensitivities and specificities of various diagnostic modalities were compared with Chi-square Test.

III. RESULTS

In this study, maximum 49% infertile women belonged to age group 26-30 years with mean age 27.85 years. Maximum number of cases (85%) were Hindu. Regarding menstrual history, 81% cases were having regular normal flow, 13% had oligomenorrhea, 4% had secondary amenorrhoea and 2% cases had heavy menstrual bleeding. (Figure 1)

Out of total 100 infertile women, 68 had primary sterility 32 had secondary type of sterility. (Figure 1)

Regarding presenting complains, leucorrhea was present in 29 (29%) cases, 16 patients (16%) have chronic lower abdominal pain and 13 patients (13%) have history of weight loss, 7 cases (7%) of them have low grade fever at night. (Figure 2)

Among these infertile women, 28% were shown positive as per culture. (Figure 2)

Figure 1

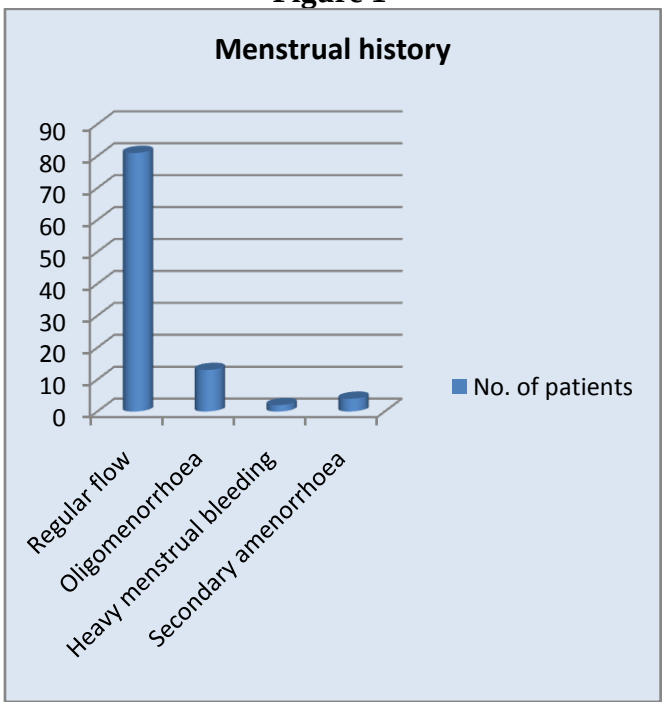


Figure 2

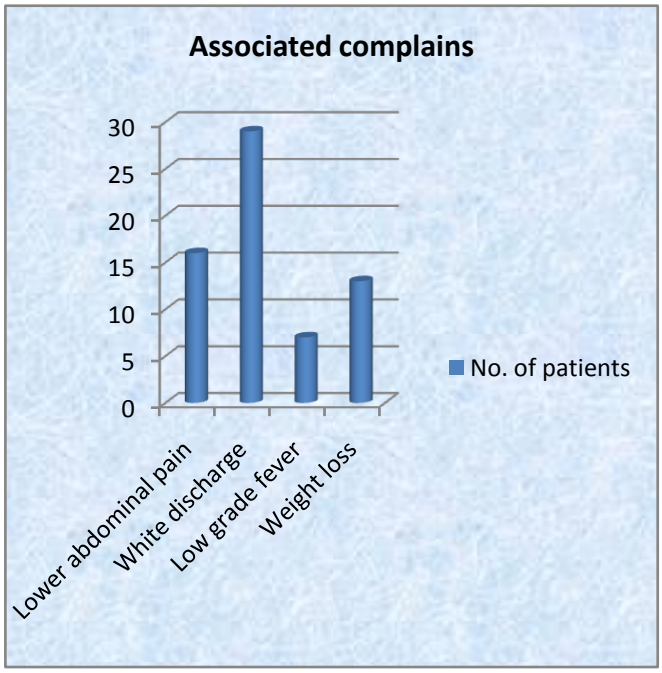


Figure 3

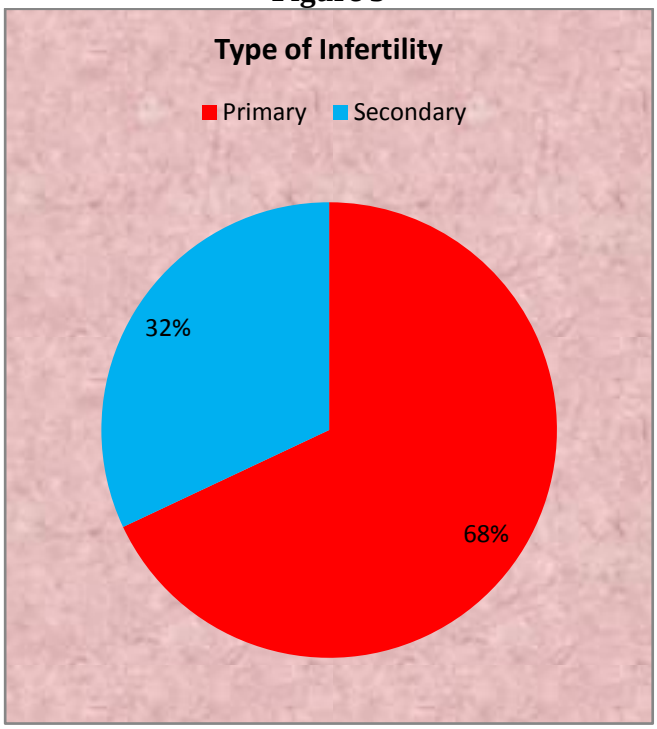
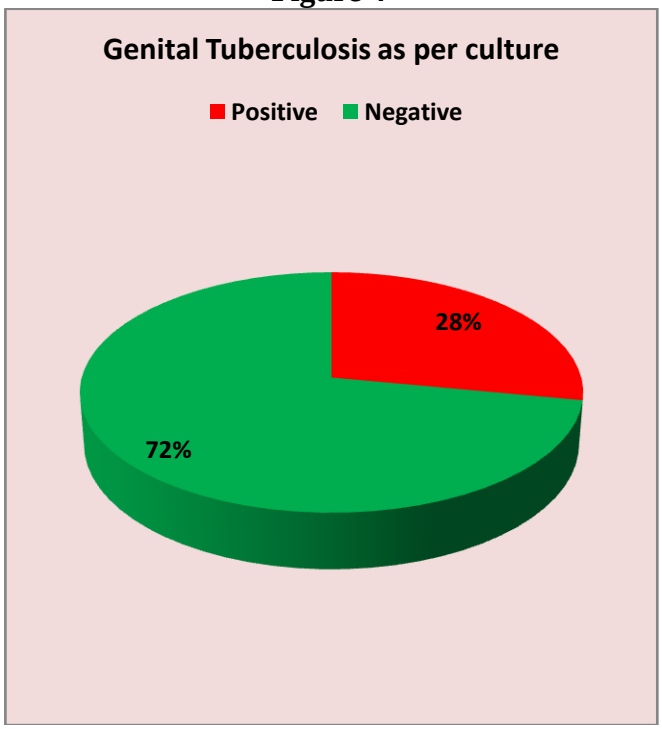


Figure 4



When proportion of cases found positives for genital tuberculosis by various modalities were compared it was found positive in 28% cases on culture, 84% cases on DHL, 52% cases by PCR, 13% cases were positive by ultrasonography (USG), 64% cases on Tuberculin test and 23% cases histopathologically in this study. So out of 100 infertile women, 28% cases were found positive on culture. 84% cases were positive on DHL, 52% cases were positive by PCR, 64% cases positive on Tuberculin test, 23% cases were positive on histopathologically and 13% cases were positive by ultrasonography in this study. (Table 1)

Table 1
Comparative results of culture, DHL, PCR, USG, Histopathology and Tuberculin Test in diagnosing Genital tuberculosis (N=100)

S. No.	Type of Diagnostic Modality	Positives	Positives in Percent
1	**Culture of Mycobacteria**	28	28
2	**DHL**	84	84
3	**PCR**	52	52
4	**USG**	13	13
5	**Tuberculin Test**	64	64
6	**Histopathology**	23	23

When diagnostic effectiveness of various diagnostic modalities, assuming culture as gold standard, in diagnosing genital tuberculosis sensitivity was found with significant variation ranging from 42.85% with ultrasonography (USG) to 92.85% with DHL. Likewise specificity was found maximum with USG (98.61%) followed by histopathology (91.66%), DHL (55.55%), PCR (52.77%) and tuberculin test (36.11%). Positive predictive value (PPV) was found maximum (92.3%) with USG and minimum (28.12%) with tuberculin test and negative predictive value (NPV) was found maximum (95.23%) with DHL and minimum (72.22%) with tuberculin test. Diagnostic effectively of diagnosing GTB with various studied modalities vary with significant variation. (Table 2)

Table 2
Comparison of Diagnostic effectiveness of DHL, PCR, USG, Histopathology and Tuberculin Test in diagnosing Genital tuberculosis assuming culture as gold standard (N=100)

S. No.	Diagnostic value	Sensitivity	Specificity	PPV	NPV
1	**PCR**	64.28%	52.77%	34.61%	79.16%
2	**DHL**	92.85%	55.55%	44.82%	95.23%
3	**USG**	42.85%	98.61%	92.30%	92.20%
4	**Tuberculin test**	64.28%	36.11%	28.12%	72.22%
5	**Histopathology**	60.71%	91.66%	73.91%	85.71%
	***P Value**	<0.001	<0.001	<0.001	<0.001

****Chi square Test***

IV. DISCUSSION

Present study observed 28% of infertile women having genital tuberculosis (based on culture). Almost similar was reported by a survey conducted by Indian Council of Medical Research (ICMR) i.e. prevalence of FGTB in India 30 per cent in 2015.

The present study showed that 28% cases were found positive on culture. 84% cases were positive on DHL, 52% cases were positive by PCR, 64% cases positive on Tuberculin test, 23% cases were positive on histopathologically and 13% cases were positive by ultrasonography. Comparable observations were made by Thangappah et al (2011)[2] who found that PCR was positive in 36.7%, HPE positive in 36.7% and culture positive in 5.6% cases. Rajib Gonchowdhury et al (2010)[8] observed positive PCR was in 44.48% cases and Venkatesh Jnanashree Arpitha et al (2016)[9] laparoscopy 60% of cases showed positive correlation with endometrial TB- PCR and tubal involvement was seen in majority of cases.

In present study, diagnostic effectiveness of various diagnostic modalities, assuming culture as gold standard, in diagnosing genital tuberculosis sensitivity was found with significant variation ranging from 42.85% with ultrasonography (USG) to 92.85% with DHL. Likewise specificity was found maximum

with USG (98.61%) followed by histopathology (91.66%), DHL (55.55%), PCR (52.77%) and tuberculin test (36.11%). Positive predictive value (PPV) was found maximum (92.3%) with USG and minimum (28.12%) with tuberculin test and negative predictive value (NPV) was found maximum (95.23%) with DHL and minimum (72.22%) with tuberculin test. Diagnostic effectively of diagnosing GTB with various studied modalities vary with significant variation.

In this study assuming culture as gold standard, sensitivity and specificity of PCR was found 64.28% and 52.77% respectively. Sensitivity and specificity of DHL was found 92.85 and 55.55% respectively. Sensitivity and specificity of USG was found 42.85% and 98.61% respectively. Sensitivity and specificity of Tuberculin Test was found 64.28% and 36.11% respectively. Sensitivity and specificity of Histopathology was found 60.71% and 91.66% respectively.

Jindal U N etall (2010)[10] found the sensitivity and specificity of laparoscopy in diagnosing GTB were 0.96 and 0.93 and those of a positive PCR were respectively 0.59 and 0.92.

Baxi Asha et al (2011)[7] reported Sensitivity and specificity of endoscopic evaluation was 85.71 and 22.8%, respectively, when compared with polymerase chain reaction (PCR).

V. CONCLUSION

It can be concluded from this present study that endoscopic evaluation is undoubtedly a very valuable tool in diagnosis of genital TB. Routine application of nucleic acid amplification test and culture in addition to clinical and endoscopic evaluation carries a great potential in improving diagnosis of genital TB especially in countries where TB is endemic.

The 28% of infertile cases were found positive for genital tuberculosis on culture. 84% cases were positive on DHL, 52% cases were positive by PCR, 64% cases positive on Tuberculin test, 23% cases were positive on histopathologically and 13% cases were positive by ultrasonography in this study. Sensitivity and specificity of PCR 64.28% and 52.77%, DHL 92.85 and 55.55%, USG 42.85% and 98.61%, Histopathology 60.71% and 91.66% and Tuberculin Test 64.28% and 36.11% respectively.

CONFLICT OF INTEREST

None declared till now.

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