Correlation Of Immunological And Pathological Parameters In Extra-Pulmonary Tuberculosis

Dhavel Patel, Vivek Kumar Roy, Subha Chandorkar, Snehl Patil, Krishan Gopal, Ritesh Kumar, Anjili Kumari,

I.   Introduction

Tuberculosis is an ancient human disease that has long been a major public health challenge in the world and remains a problem in most developing countries. India is the highest TB burden country accounting for one fifth (21%) of the global incidence (Global annual incidence estimate is 9.4 million cases out of which it is estimated that 2 million cases are from India). India is 17th among 22 High Burden Countries in terms of TB incidence rate. (Source: WHO global TB report 2010).

This disease has not yet come under control due to various factors :

*   Low socio-economic conditions, poor nutrition.
*   Non-affordability of investigations & treatment.
*   Delayed in diagnosis of tuberculosis.
*   Resistant to anti- Tubercular Drugs.
*   The HIV pandemic.

Tuberculosis in one part of globe is a danger to the whole globe. Extra-pulmonary tuberculosis refers to disease outside the lungs. Primary infection with tuberculosis and during any subsequent secondary active disease the bacteria are spread by blood or the lymphatic system to other parts of the body. In healthy people these bacteria are usually destroyed by the immune system. If some immune deficit is present some may concentrate at a particular site where they may lie dormant for years or even decades before causing disease. Constitutional symptoms of extrapulmonary tuberculosis includes: Fever, Anorexia, Weight loss, Malaise, Fatigue ,etc. The most common sites of infection for extra-pulmonary TB in order of frequency are:

*   Lymph glands
*   Pleura
*   Genito-urinary tract.
*   Bones and joints (also called osteotuberculosis)
*   Meninges, which may be rapidly fatal if not, treated in time
*   Bowel and/or peritoneum
*   Pericardium
*   Skin

Tubercular bacilli are very slow growing, causes delayed presentation more because of body immune response rather than bacteria itself. The bacilli are difficult to isolate & culture. It has always been challenge to diagnose tuberculosis. But the tragedy is that there is a wide gap between expectations and achievements, especially in developing countries. Even though pulmonary tuberculosis is the most common form of tuberculosis, it can affect any organ and these extra pulmonary forms pose diagnostic problems, as bacteriologic confirmation is extremely difficult.

No test is confirmatory to diagnosis of tuberculosis except microbiological proven tubercular bacilli in the diseased tissue.

Today many tests are available to determine bacterial DNA or immune response to the bacteria. This study is an attempt to find out sensitivity of these tests in extra pulmonary tuberculosis.

II.   Aim And Objectives

TO study and evaluate sensitivity of various immunological and pathological parameters in Extra-pulmonary tuberculosis.

*   To study sensitivity of conventional pathological test e.g. ESR, Tuberculin test, 24-hrs Urine AFB, FNAC,biopsy in case of Extra-pulmonary tuberculosis.
*   To evaluate role of newer diagnosis method e.g. Blood/fluid PCR, serum immunological markers in diagnosis of Extra-pulmonary tuberculosis.

III. Materials And Methods

This is a prospective study of 90 cases of Extra-pulmonary tuberculosis attend in Bharati hospital and department of surgery. Study period is between Aug.2009 to Aug.2011.

Inclusion Criteria:
1. All age group patients suspected to have Extra-pulmonary tuberculosis.
2. All cases who responded to Anti-tuberculosis treatment (ATT) after 6-weeks of treatment were included in this study.

Exclusion criteria:
1. Patient not responding to ATT after 6-weeks of treatment or those who had no follow-up were excluded from this study.
2. Associated concomitant pulmonary tuberculosis patient where excluded.

METHODS:

The details history and clinical examination is done for each patient and enter in profoma.

Following investigations were carried out in all cases.

- ESR
- Tuberculin test
- X-ray chest
- Sputum AFB

Following investigation were carried out in for confirmation of diagnosis.

- Serum IgG, IgM, IgA for tuberculosis
- Serum TB- PCR or Fluid/Tissue TB-PCR
- FNAC, Biopsy, ZN culture, 24-Urine for AFB

Collected data was analyzed for sensitivity by performance of a binary classification test as only diagnosed cases of for extra-pulmonary tuberculosis had included in this study

On investigation cases having equivocal reports were taken as 'positive' for extra-pulmonary tuberculosis because of high prevalence of tuberculosis in india.

IV. Observations

Table 1: Gender wise distribution of cases in study group.

Gender	Number of patients	Percentage (%)
Male	40	44.4
Female	50	55.6
Total	90	100.0

The above table shows gender wise distribution of cases in study group. Majority of the cases are females i.e. 50(55.6%) as compared to males i.e. 40(44.4%).
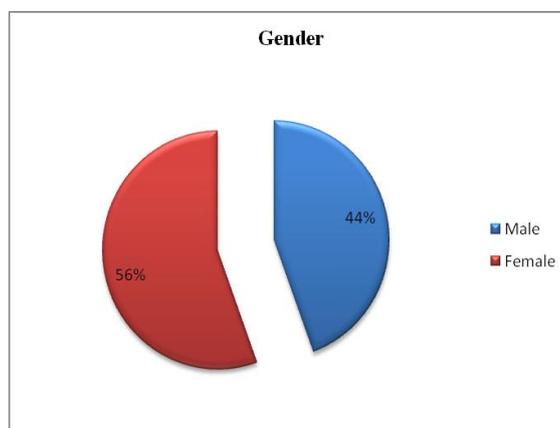
Table 2: Age wise distribution of cases in study group.

Age group	Number of patients	Percentage (%)
< 10	2	2.2
11 – 20	20	22.2
21 – 30	29	32.2
31 – 40	24	26.7
41 - 50	12	13.3
> 50	3	3.3
Total	90	100.d0

The above table shows age wise distribution of cases in study group. Majority of the cases i.e. 29(32.2%) are in the age group of 21 to 30 yrs followed by 24 cases in 31 to 40 yrs, 20 cases in 11 to 20 yrs and 12 cases in 41 to 50 yrs age group. Only 2 cases are seen in age group of 1 to 10 and 51 to 60 yrs age group respectively. Remaining one case was in age group of more than 60 yrs.
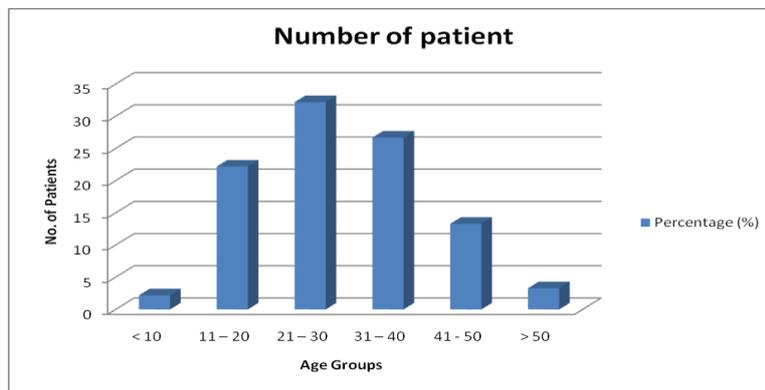
Table 3: Site wise distribution of cases in study group.

Site	Number of patients	Percentage (%)
Lymph nodes (Excluding Intra-abdominal lymph nodes)	75	83.3
Abdominal Koch's (With abdominal lymph nodes)	6	6.7
Spine and Bone	3	3.3
Meningitis	3	3.3
Others (genitourinary, perianal fistula)	3	3.3
Total	90	100.0

The above table shows disease wise distribution of cases in study group. Majority of the cases i.e. 75(83.3%) have lymph nodes involvement form of extra pulmonary tuberculosis. 6 (6.7%) cases have abdominal Koch's. Pott's spine, Meningitis and others have 3(3.3%) cases each showing the form of extra pulmonary tuberculosis.
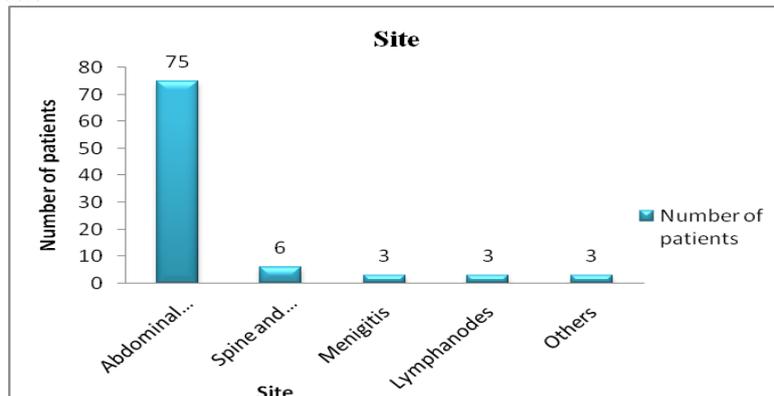
Table 4: Presenting General Symptom wise distribution of cases in study group. Presenting Symptoms

	Fever	Weight Loss
Yes	65 (72.2%)	30 (33.3%)
No	25 (27.8%)	60 (66.7%)
Total	90(100%)	90(100%)

Table 5 : History of BCG Vaccination

H/O BCG	Number of patients	Percentage (%)
Yes	81	90.0
No	9	10.0
Total	90	100.0

The above tables show General symptoms wise distribution of cases in study group. Among 90 cases 65(72.2%) of cases have fever remaining 25(27.8%) did not fever as presenting symptom. Among 90 cases, 30(33.3%) cases have weight loss comparing with 60 (66.7%) without weight loss. Among 90 cases, 81 (90%) cases have positive history of taken BCG vaccine compared to only 9 cases without history of BCG vaccine.
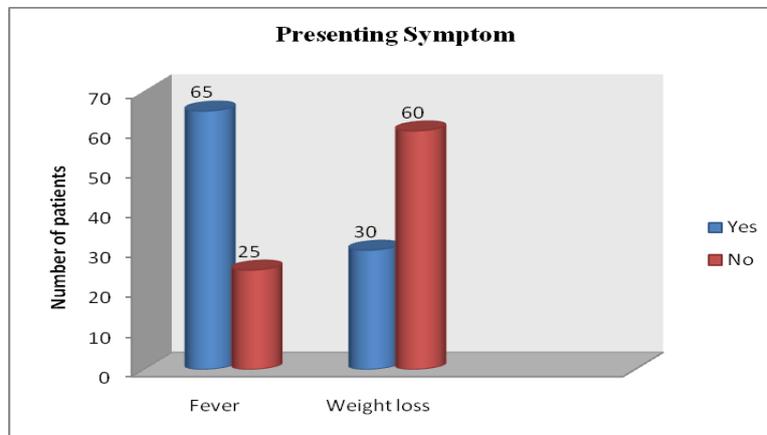
Table 6: ESR findings wise distribution of cases in study group.

ESR	Number of patients	Percentage (%)
Normal	34	37.8
Raised	56	62.2
Total	90	100.0

The above tables show symptoms ESR finding among cases in study group. Among 90 cases, 56(62.2%) of cases have raised ESR and remaining 34(37.8%) cases ESR was normal, hence sensitivity of ESR was 62%.
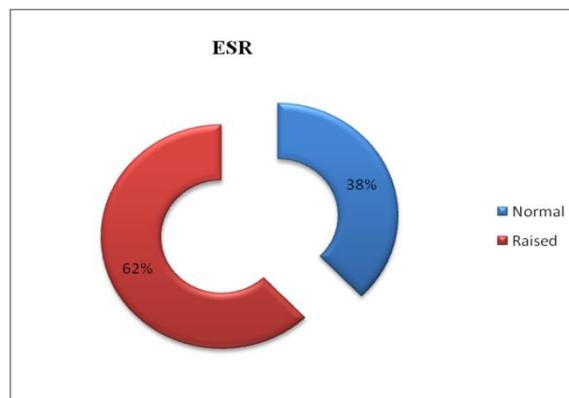
Table 7: TT result wise distribution of cases in study group.

TT result	Number of patients	Percentage (%)
Positive	39	43.33%
Negative	45	50.00%
Equivocal	6	6.66%
Total	90	100.0

The above tables show symptoms Tuberculin test result finding among cases in study group. Among 90 cases, 39(43.33%) of cases have positive result, 45(50.00%) cases had tuberculin test result as negative and 6(6.66%) have Equivocal results, hence sensitivity of tuberculin test was 50%.
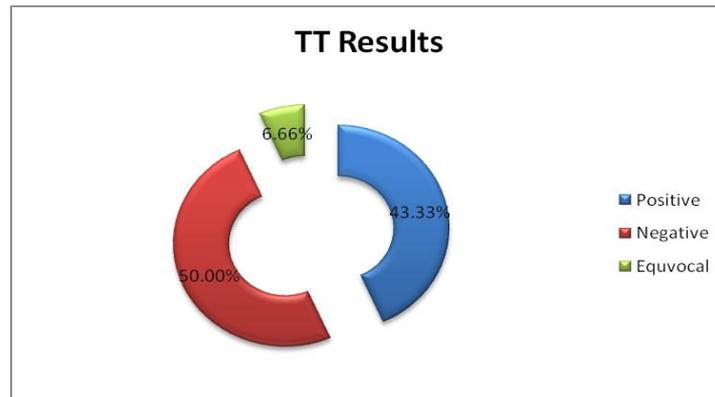
Table 8: Sputum AFB findings wise distribution of cases in study group.

Sputum-AFB	Number of patients	Percentage (%)
Positive	11	12.2
Negative	79	87.8
Total	90	100.0

The above tables show symptoms Sputum AFB result finding among cases in study group. Among 90 cases only 11(12.2%) of cases have positive result for AFB in sputum and remaining 79(87.8%) cases had negative result for AFB on sputum microscopy. So sputum AFB sensitivity was 12%.
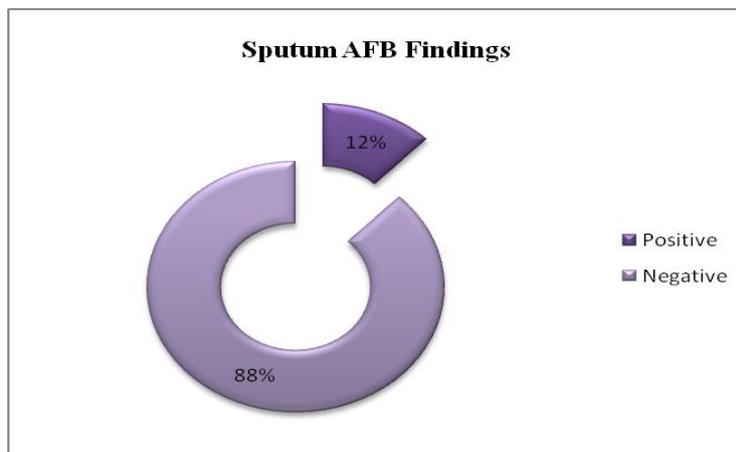
Table 9: IgM, IgA and IgG result wise distribution of cases in study group. a) IgM

Results	IgM	IgG	IgA
Positive	8 (38.10%)	12 (60.0%)	3 (23.10%)

Negative	12 (57.10%)	2 (10.0%)	0 (0.00%)
Equivocal	1 (4.8%)	6 (30.0%)	10 (76.9%)
Total	21	20	13

The above tables show IgM, IgA and IgG findings among cases in study group. Among 90 cases, IgM was done on 21 patients out of which 8(38.1%) cases showed positive finding and 12(57.1%) cases showed negative finding for IgM and remaining one case showed equivocal result for IgM. So sensitivity of IgM was 43%. Among 13 cases with IgA testing 10 (76.9%) were equivocal for IgA and remaining 3 (23.1%) showed positive result. So sensitivity of IgA was 100%. 20 patients who evaluated with IgG, finding showed that 12(60%) cases had positive result, 6(30%) cases had equivocal result and remaining 2(10%) showed negative finding. So sensitivity of IgG was 90 %. In sensitivity of IgM, IgA and IgG all equivocal cases were included in positive cases.
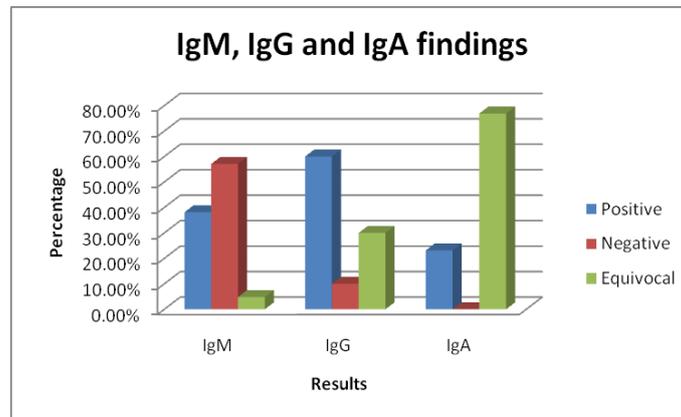
Table 10: FNAC result wise distribution of cases in study group.

FNAC	Number of patients	Percentage (%)
Positive	57	73.1
Negative	11	14.1
Borderline	10	12.8
Total	78	100.0

The above tables show FNAC result finding among cases in study group. Among 78 cases 57(73.1%) of cases had been reported as tubercular lymphadenitis. 11 (14.1%) cases had reported as negative result. So sensitivity was 86%. Remaining 10 (12.8%) cases had borderline result meaning that they could neither be diagnosed nor could be ruled out for the presence of TB. Patients who were borderline FNAC were correlated with immunological parameters and PCR.
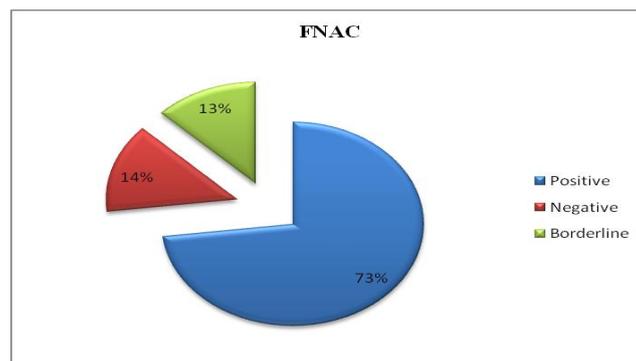
Table 11: Biopsy result wise distribution of cases in study group.

Biopsy	Number of patients	Percentage (%)
Positive	13	86.7
Negative	2	13.3
Total	15	100.0

The above tables show biopsy result finding among cases in study group. Among 15 cases majority i.e. 13(86.7%) of cases have positive result on biopsy for diagnosing extra pulmonary tuberculosis and remaining 2 (13.3%) cases had negative result on biopsy, hence sensitivity of biopsy was 87%.
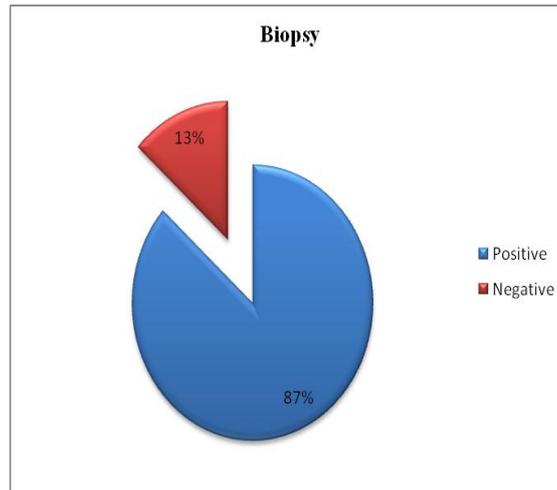
Table 12: AFB culture result wise distribution of cases in study group.

AFB culture	Number of patients	Percentage (%)
Positive	9	90.0
Negative	1	10.0
Total	10	100.0

The above tables show AFB culture result finding among cases in study group. Among 10 cases majority i.e. 9(90%) of cases have positive result on AFB culture for diagnosing extra pulmonary tuberculosis and remaining 1 (10%) cases had negative result on AFB culture. So sensitivity was 90%.
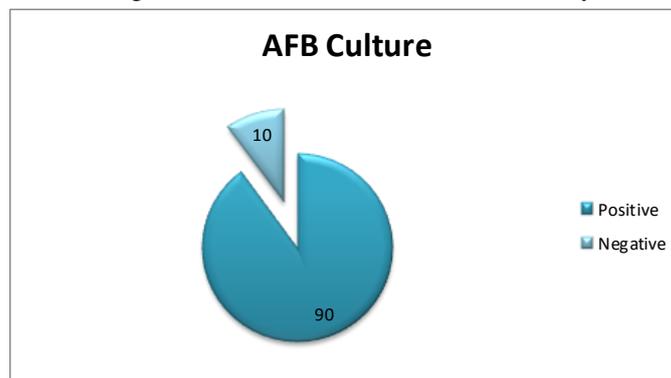
Table 13: PCR fluid and Blood result wise distribution of cases in study group. PCR Blood & Fluid

PCR	PCR Fluid	PCR Blood
Positive	7 (77.8%)	9 (42.9%)
Negative	2 (22.2%)	12 (57.1%)

Total	9	21

The above tables show PCR (Fluid and Blood) result findings among cases in study group. Among 90 cases, PCR fluid was done on 9 patients out of which 7(77.8%) cases showed positive result and 2(22.2%) cases showed negative result for extra pulmonary tuberculosis. So sensitivity was 78%. Among 21 cases with PCR blood examination, majority i.e. 12(57.1%) showed negative result and remaining 9 cases had positive result. So sensitivity was 43%.
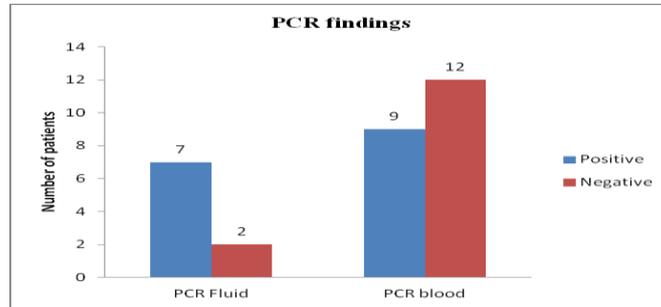
Table 14: Urine AFB result wise distribution of cases in study group.

Urine AFB	Number of patients	Percentage (%)
Positive	17	73.9
Negative	6	26.1
Total	23	100.0

The above tables show urine AFB result finding among cases in study group. Among 23 cases majority i.e. 17(73.9%) of cases have positive result for urine AFB for diagnosing extra pulmonary tuberculosis and remaining 6 (26.1%) cases had negative result on urine AFB. So sensitivity was 74%.
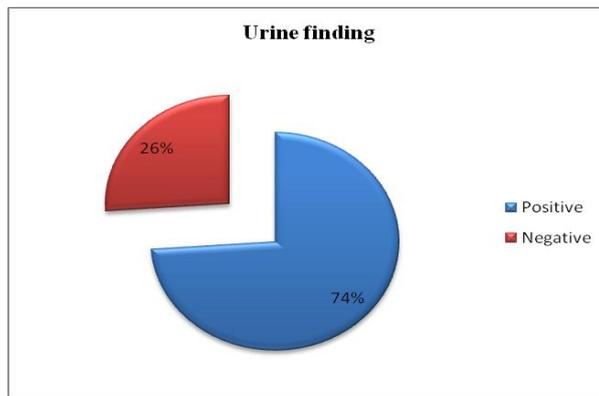
V.   Discussion

The present study was conducted with the aim to evaluate sensitivity of various immunological and pathological parameters in extra pulmonary tuberculosis. 90 patients with suspected extra pulmonary tuberculosis were included in the study based on the following inclusion and exclusion criteria.

Inclusion criteria:
a.   All age group patients suspected to have extra pulmonary tuberculosis.
b.   All cases that responded to ATT after 6-weeks of treatment were included in this study.

Exclusion criteria:
a.   Patients not responding to ATT after 6-weeks of treatment or those who had no follow-up were excluded from this study.

SEX

Gender wise distribution of study cases showed that there were more female patients 50(55.6%) as compared to male patients 40(44.4%) . So the female proportion was high compared to males.

AGE

In our study, the eldest patient was 65 years old and the youngest patient was 3 years of age. Age distribution among study cases showed that majority of cases i.e. 29(32.2%) are in the age group of 21 to 30 yrs followed by 24(26.7%) cases in 31 to 40 yrs, 20(22.2%) cases in 11 to 20 yrs and 12(13.3%) cases in 41 to 50 yrs age group. Only 2(2.2%) cases are seen in the age group of 1 to 11 and 51 to 60 yrs age group respectively. Remaining 1(1.1%) case was in age group of more than 60 yrs. Similar finding was seen in a study conducted by Samaila MOA et al[52] which showed that majority of cases i.e. 19(45.24%) was in age group in 21 to 30 yrs followed by 9(21.43%) cases in 31 to 40 yrs,7(16.67%) cases in 0 to 10 yrs, 6(14.29%) cases in 11 to 20 yrs and 41 to 50 yrs, only 1(2.38%) case in 51 to 60 yrs. Highly incidence of tuberculosis was seen who were in working age group (21-40 years)

SITE

Types of extra pulmonary tuberculosis distribution showed 75(83.3%) cases were of tuberculous lymphadenitis. 6(6.7%) cases had abdominal Koch's, 9(9.9%) cases had other (spine and bone, meningitis, genitourinary, perianal fistula) form of extra pulmonary tuberculosis. Amongst the groups of lymph nodes involved, the commonest group was cervical lymph nodes. Similar finding was seen in a study conducted by Chandrashekhar T Sreeramareddy et al[24]show that the commonest form of tuberculosis were pulmonary TB (46.3%), followed by extra-pulmonary TB (41.4%) and extra pulmonary tuberculosis was mainly localized to lymph node (50.7%), and abdomen (12%). In another study conducted by Md. Wasim Hussain et al[27] who studied the prevalence and pattern of extrapulmonary tuberculosis in Rajshahi. Extrapulmonary tuberculosis accounted for about 16% of total tuberculosis cases. Tuberculous lymphadenitis was found to be the commonest form of extrapulmonary tuberculosis, comprising about 75% of the extrapulmonary cases.

Weight loss

Among 90 cases, 30(33.3%) cases had weight loss comparing with 60 (66.7%) without weight loss. Basu S et al (2007)[53] in their study of abdominal TB, out of 115 cases, 79(68.70%) cases had weight loss.

FEVER

Among 90 cases 65(72.2%) of cases had fever remaining 25(27.8%) did not have fever as a presenting symptom. This is comparable to a study conducted by Md. Wasim Hussain et al [27] where, in their study 405 cases of Extra-pulmonary TB 307(75.80%) of cases had fever. Chandrashekhar et al [24] had also showed that 70 (43.2%) of cases had fever in extra pulmonary tuberculosis.

ESR

In the present study 62.2% (56) of cases had raised ESR compared to 37.8% (34) of cases with normal ESR finding. So sensitivity was 62%. Md. Wasim Hussain et al[27] showed 86% cases of Extra-pulmonary TB had raised ESR. Basu S et al[53] (2007) who conducted a study in abdominal tuberculosis in Indian children showed that 55.65% cases had raised ESR.

Tuberculin test

In the present study, 39 (43.33%) of cases had positive result, 45(50.00%) cases had tuberculin test result as negative and 6(6.66%) cases had Equivocal results. So sensitivity was 50%. A study by Mahwish Rabia et al (2010)[63] showed that among 100 cases of Paediatric TB 72(72%) cases had positive tuberculin testing. Zuber ahmad et al (2003)[30] showed that 240 cases of tubercular lymphadenitis, 156(65%) cases had positive reaction to tuberculin test. Md.Wasim et al (2004), in their study of extra-pulmonary TB showed that 314(77.53%) cases had positive tuberculin test.

Sputum for AFB

Sputum smear examination for Acid fast bacilli showed only 12.2% of cases positive for sputum smear for AFB compared to 87.8% who had negative finding for sputum smear examination for AFB. So sensitivity was 12%. That shows only 12.2% of cases had active primary focus of Pulmonary TB bacilli. Similar finding was seen in a study conducted by Shukla I, Varshney S, Sarfraz, Malik A, Ahmad Z [34] who compared sensitivity and specificity of the PCR from smear and culture in the diagnosis of suspected cases of pulmonary and extra pulmonary tuberculosis on 140 specimens obtained from suspected cases of tuberculosis. Out of 140 patients, 61.4% were suffering from pulmonary tuberculosis and 38.5% from extra-pulmonary tuberculosis. In these 140 patients only 28.5% were ZN smear positive for AFB.

24 hours Urine AFB

In the present study, 24 hours urine AFB was sent on a total of 23 cases out of which 17(73.9%) cases reported positive on urine AFB and 6(26.1%) cases reported negative for extra pulmonary tuberculosis on urine AFB examination among 23 cases. So sensitivity was 74%. In a study conducted by S.K. Agrawal et al [62] showed that 10.9% of cases reported positive on urine AFB.

FNAC

Maximum cases (73.1%) were positive diagnosed with extra pulmonary tuberculosis on fine needle aspiration cytology. 14.1% of cases were negative and 12.8% of cases had borderline finding on fine needle aspiration cytology. So sensitivity was 86%.

FNAC	Present study (2011)	ZuberAhmad (2003)[30]	S.K.Lau et al (2007)[58]	SULAIMAN AHMED et al (2010)[64]
Positive	73.1%	70%	77%	(72.8%)
Borderline	12.8%	-	-	(11.4%)
Negative	14.1%	30%	23%	(15.8%)

FNAC was done in a total of 78 patients out of which 75 patients had palpable lymph nodes and the remaining three were cases of abdominal Koch's, peri-anal fistula and meningitis.

Above table shows comparison of FNAC finding with studies conducted by Zuber Ahmad, S.K.Lau et al and Suleiman Ahmed et al. Similar result was seen in all the study comparing to our study for positivity on fine needle aspiration cytology in diagnosing extra pulmonary tuberculosis. Borderline result on FNAC showed similarity in Sulaiman Ahmad et al. In our study negative finding on FNAC was less compared to study conducted by Zuber Ahmad and S.K.Lau et al. Sulaiman Ahmad et al reported very less negative result on Fine needle aspiration cytology compared to our study.

Biopsy

Biopsy result among 15 study cases showed that 13 (86.7%) cases were positively diagnosed for extra pulmonary tuberculosis and only 2 cases were negative on biopsy. So sensitivity was 87%. Similar finding was seen in a study conducted by Madhu Nagpal et al (2001)[54] showed that 69.06% cases were positive diagnosed for extra pulmonary tuberculosis. Chandrashekhar et al (2008)[24] showed that among 7 cases, 7 cases were positive for AFB.

Biopsy was taken in the 15 cases whose FNAC was reported either negative or borderline (cases which were excluded are those which were diagnosed to be TB on PCR or immunological parameters). Two cases who were negative on biopsy, one had presented with a swelling in right axilla having complaints of evening fever, ESR raised, PCR blood, IgG, IgM, IgA was positive and was started on ATT and the patient responded to ATT. Another case presented with abdominal pain having evening fever, ESR raised, tuberculin test was positive, PCR fluid was positive and on the basis of these investigations, patient was started on ATT and the patient responded to ATT.

AFB Culture

Among 90 cases 10 cases undergone AFB culture result finding showed 9(90%) of cases were positive for extra pulmonary tuberculosis and 1(10%) of cases were negative for extra pulmonary tuberculosis on AFB culture. So sensitivity was 90%. In a study conducted by Sajjad Iqbal et al (2010)[59] showed that 27.81% positive for extra pulmonary tuberculosis. Another study conducted by M. Kashif et al (2003)[60] showed that sensitivity of 20.84% for extra pulmonary tuberculosis.

Immunological Parameters.

Immunological testing included IgM, IgA and IgG and was carried out on study cases which had suspected extra pulmonary tuberculosis. IgM was positive among 8 (38.1%) cases, IgA was positive among 3 (23.1%) of cases and IgG was positive among 12 (60%) of cases. Majority of cases with negative finding was seen among IgM and IgA. 1 case in IgM showed equivocal result and 2 cases showed equivocal result in IgG testing.

Sensitivity	Present study (2011)	Sohelia khalizadeh et al (2002)[55]	Hamid Emadi et al (*2008*)[56]	Walid Ben et al (2010)[57]
IgG	90%	37.3%	54.3%	84%
IgM	43%	70.6%	43.3%	-
IgA	100%	29.4%	70.1%	21%

Above table shows the comparison sensitivity of our study findings with Sohelia khalizadeh et al, Hamid Emadi et al and Walid Ben et al. Almost Similar finding was seen in a study conducted by Walid Ben et al. for IgG. Contrast finding was reported by Sohelia Khalizadeh et al as sensitivity for IgG was very less compared to our study finding. Resemblance in finding was seen with IgM also after comparing with Hamid Emadi et al and higher sensitivity was reported by Sohelia khalizadeh et al for IgM. Both Sohelia khalizadeh et al and Wajid Ben et al found IgA less sensitive in detecting extra pulmonary tuberculosis.

IgG, IgM and IgA was not sent in cases whose diagnosis had already been confirmed either by FNAC or open biopsy or PCR.

Positive IgM antibodies indicated acute stage of the illness and may be characteristic of early disease or primary tuberculosis. IgM positivity may also be seen in BCG vaccination, post tuberculine test (upto 10 days). Presence of IgM antibodies in an otherwise healthy individual indicates the start of infection.

Positive IgG antibodies appear when an infection is well established indicating a good immunological responded. High level of IgA or IgG antibodies in healthy individual indicates regular contacts with an infectious source. These individual can be monitored periodically to determine if infection is latent or is progressive to active disease.

PCR blood and fluid

Among 90 cases, PCR blood examination was done in 21 cases which showed positive finding in 9(42.9%) and negative finding in 12(57.1%) cases and in fluid PCR examination done in 9 cases showed positive finding in7(778%) and negative finding in2(22.2%). Maximum cases in PCR blood were reported negative.

PCR blood	Present study (2011)	Soumitesh et al (2005)[25]	V C C Cheng et al (2004)[33]	Gabriela et al (2005)[23]
Sensitivity	43%	75.5%	78.3%	57.1%

PCR Fluid	Present study (2011)	AH Rasit et al (2011)[61]	V C C Cheng et al (2004)[33]	Shukala et al (2011)[34]
Sensitivity	78%	94%	80%	74.2%

Above table shows that sensitivity of PCR blood was found to be less compared to studies conducted by Soumitesh et al, V C C Cheng et al and Gabriela et al. Among PCR fluid sensitivity, it showed resemblance with V C C Cheng et al and Shukala et al. AH Rasit et al reported maximum sensitivity for detecting extra pulmonary tuberculosis among suspects.

PCR was sent in a total of 30 cases as we were doubtful regarding the confirmed diagnosis of these patients or in cases where we were not able to carry out any confirmatory investigations i.e. FNAC, biopsy or immunological parameters. PCR fluid was sent in 9 cases, as we were able to collect fluid samples from the respective patients. PCR blood was sent in 21 cases where we were unable to collect any fluid samples.

Negative PCR may be seen if the number of bacilli in the sample is below the detection limit of the assay i.e. 1-10 bacilli per PCR or if an inappropriate sample is submitted for analysis. Sample contamination during specimen collection may yield false positive results. PCR fluid is highly sensitivity and valuable adjunct in the diagnosis of infection caused by M.tuberculosis and other Mycobacteria than PCR blood in present study.

VI.   Summary And Conclusion

The present study was conducted with the aim to evaluate sensitivity of immunological and pathological parameters in extra pulmonary tuberculosis. 90 patients with suspected extra pulmonary tuberculosis were included in the study.

The sensitivity of immunological parameters in extra pulmonary tuberculosis in our study was as follows: IgG - 90%, IgM-43% and IgA-100%.

The sensitivity of PCR blood was 43% and that of PCR fluid was 78% in our study.

The sensitivity of pathological parameters in extra pulmonary tuberculosis was ESR - 62%, Sputum AFB - 12%, FNAC - 86%, Biopsy - 87% and Tuberculin test - 46%, 24-hrs urine AFB - 74%.

Diagnosis of extra pulmonary tuberculosis is challenging. Before staring of anti-tuberculosis treatment therapy we need to consider verification investigation modalities. FNAC and Biopsy are most reliable methods to diagnose extra pulmonary tuberculosis as compared to blood investigation.

The World Health Organization (WHO) says that widely used blood tests to detect tuberculosis are "dangerous" to patients because they are unreliable. Blood tests (PCR, Immunological parameters) are often used in developing countries such as India, where an estimated three million people are infected with the disease. The use of currently available commercial blood (serological) tests to diagnose active tuberculosis (TB) often leads to misdiagnosis, mistreatment and potential harm to public health, says WHO in a policy recommendation issue. WHO is urging countries to ban the inaccurate and unapproved blood tests and instead rely on accurate microbiological or molecular tests, as recommended [65]. However, use of pathological parameters in extra pulmonary tuberculosis like FNAC, Biopsy, sputum AFB are more reliable methods to diagnose extra pulmonary tuberculosis.