Section: General Medicine

Original Research Article

A TERTIARY HOSPITAL- BASED CROSS-SECTIONAL STUDY OF TB CO-INFECTION IN HIV PATIENTS IN THIRD HIGHEST HIV PREVALENCE STATE IN INDIA

Ningthoukhongjam Reema[1], R Shonsan Koireng[2], Thangjam Gautam Singh[3], Thiyam Brojendro Singh[4], Shailesh Kumar[5], Konsam Bidyalaxmi Devi[6], Laishram Bandeep[7], Anirban Ghosh[8]

[1]Assistant Professor, Department of Medicine, Regional, Institute of medical sciences RIMS, Imphal, Manipur, India.
[2]Junior Resident, Department of Medicine, Regional, Institute of medical sciences RIMS, Imphal, Manipur, India.
[3]Associate Professor, Department of Radiodiagnosis, Shija, Academy of Health Sciences, Imphal, India.
[4]Professor, Department of Medicine, Department of Medicine, Regional, Institute of Medical Sciences RIMS, Imphal, Manipur, India.
[5-8]Junior Resident, Department of Medicine, Regional, Institute of Medical Sciences RIMS, Imphal, Manipur, India.

Received : 07/06/2025
Received in revised form : 25/07/2025
Accepted : 14/08/2025

Keywords:
HIV, CD4 count, pulmonary tuberculosis, extrapulmonary tuberculosis, HIV-TB co infection, opportunistic infection.

Corresponding Author:
Dr. Ningthoukhongjam Reema,
Email: thangjamreema@gmail.com

DOI: 10.47009/jamp.2025.7.4.190

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (4); 992-999

ABSTRACT

Background: Human Immunodeficiency virus (HIV) co-infection with tuberculosis (TB) is a serious public health concern, particularly in developing nations. In India, the rate of HIV-TB co-infection was 3.8% as per Global TB Report 2021.Tuberculosis is the leading opportunistic infection in HIV-infected individuals and accelerates HIV progression. The immune suppression caused by HIV increases the risk of active TB, leading to atypical presentations and delayed diagnoses. HIV further impairs the immune response, promoting TB susceptibility through disrupted macrophage functions and immune mechanisms. With a high global co-infection rate, this study aims to investigate the clinical and radiological features of HIV-TB co-infection and its correlation with CD4 count in adult HIV positive patients in Manipur. **Materials and Methods:** This hospital-based cross-sectional study was conducted at the Centre of Excellence (CoE) ART Centre, Department of General Medicine, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, from April 2022 to July 2025. All HIV-positive individuals with any form of TB, either microbiologically confirmed or clinically diagnosed were included. Chest X-ray, sputum microscopy, GeneXpert, and culture for TB diagnosis were done, while HIV was confirmed per NACO guidelines using ELISA/Rapid test. CD4 count and HIV viral load were assessed. Statistical package for social sciences (SPSS v22) was used for statistical analysis. Ap value <0.05 was considered as statistically significant.**Result:** A total of 50 patients with HIV –TB co infection were enrolled.Maximum patients had heterosexual transmission (30, 60%). Majority (29,58%) participants had CD4 <200. Oral candidiasis (13, 26%) was the most common opportunistic infection. Most of study subjects (8, 16%) had normal CXR findings followed by infiltration in 6(12%), and nodular patterns seen in 2(4%) patients. On ultrasound scanning, majority of the participants (34, 68%) had normal findings followed by lymphadenopathy (LAP) (12,24%). Pulmonary tuberculosis (PTB) alone was seen in 15 (30%) subjects. Extrapulmonary tuberculosis (EPTB) alone was present in 14(28%) of cases and abdominal TB was the most common EPTB form seen (21,42%). Based on diagnostic methods, majority of the subjects were microbiologically confirmed TB (13,86.7%) while 2(13.3%) was clinically diagnosed. **Conclusion:** The present study concluded that HIV/AIDS patients with PTB can present with both typical and atypical chest radiograph and USG finding patterns, with atypical features more observed in those with CD4<200 cells/ul. Involvement of lungs was atypical; diffuse or mid and lower zone involvement than classical upper lobe involvement. A high index of suspicion is necessary for the accurate and timely diagnosis of tuberculosis in HIV positive patients. On the other hand, serological testing for HIV should be carried out when a diagnosis of TB is made.

INTRODUCTION

Tuberculosis is an infectious disease which affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB) and is caused by the bacillus Mycobacterium tuberculosis.[1] Tuberculosis is the commonest opportunistic infection (OI) responsible for most of the deaths in people living with HIV (PLHIV). Atypical clinical presentation and involvement of inaccessible sites and low sputum smear positivity make the diagnosis of TB in HIV infected patientschallenging.[2] Further, there has been an increase in rates of drug-resistant tuberculosis, including multi-drug (MDR-TB) and extensively drug-resistant TB (XDR-TB), which are difficult to treat and contribute to increased morbidity and mortality. Anti-tuberculosis (ATT) and antiretroviral (ARV) drugs are required to be administered concomitantly in HIV TB co-infected patients. In developing countries, TB is one of the manifestations of AIDS in >50% cases. TB shortens the survival of patients afflicted with HIV infection, may accelerate the progression of HIV and is the cause of death in one third of people with AIDS worldwide, mainly due to increase viral replication by M. tuberculosis.[3] The combination of HIV and TB has been referred to as "the cursed duet".[4] because it has been shown to have a significantly higher influence on epidemiologic advancement and, in turn, on the global health landscape. HIV-negative people have a 10% lifetime risk of having TB, whereas the lifetime risk of TB in HIV infected patients is 50%–70%,[3] due to the depletion of CD4+ T cells, a hallmark of AIDS.[5]

In India, 53,000 patients with HIV-positive TB were reported, according to the Global TB Report 2021. The co-infection of HIV and TB claimed the lives of almost 11,000 individuals.[6] Persons living with HIV (PLHIV) in India were 20 times more likely to have TB than persons without HIV.[7]There have been reports of high death rates (15–18%) among TB cases with HIV.[8]

In a study in Manipur by S Bhagyabati Devi et al., TB was found in 55% of HIV infected patients compared to 25% in sero-negative patients.[9] HIV and TB co-infection is closely and causally linked to illiteracy, homelessness, poverty, alcoholism, drug addiction, unemployment, and malnutrition.[10] Among the risk factors for co-infection, heterosexual promiscuity and casual sex was found to be the most important by some Indian observers while others observed that the majority were intravenous drug abusers.[9] The most prevalent method of HIV infection is heterosexual transfer, and it is more prevalent in sexually active age groups.[11]

Approximately one-third of the global population is believed to harbor latent Mycobacterium tuberculosis (M. tuberculosis) infection, though this estimate is debated.[11]The risk of progressing from latent infection to active disease varies widely. Around 10% of infected individuals develop active TB, with approximately half of these cases occurring more than two years after infection, termed "reactivation" or post-primary TB.[12] CD8+ T cells also contribute to controlling latent TB, but their role is less understood.[13-16]Additionally, HIV-associated mechanisms exacerbate TB susceptibility, including up regulation of M. tuberculosis entry receptors on macrophages,[17] HIV-mediated manipulation of macrophage bactericidal pathways,[18] impaired chemotaxis,[19] and a shifted Th1/Th2 immune balance.[20] HIV also disrupts tumor necrosis factor (TNF)-mediated macrophage apoptosis, a critical process for containing M. tuberculosis, thereby facilitating bacterial survival.[21] These mechanisms collectively highlight the intricate interplay between HIV and TB, contributing to the increased risk of TB reactivation and new infections in HIV-positive individuals.

Given that TB has emerged as a deadly counterpart in HIV epidemiology, it is of utmost necessity to understand the multifactorial association of TB-HIV. This study attempts to understand the various clinical presentation and radiological features of HIV-TB co infection in third highest prevalent state in the country.

MATERIALS AND METHODS

This is a hospital based cross sectional study conducted in the conducted among HIV infected study participants age 18 years and above, attending centre of excellence (CoE) ART Centre, Department of General Medicine, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur for a period of two years from April, 2022 to July, 2025.

Inclusion Criteria: Study participants with known or newly diagnosed HIV infection with any form of TB (pulmonary or extra pulmonary or both) either microbiologically confirmed or clinically diagnosed, were included.

Exclusion Criteria: Study participants with any comorbid condition (liver failure, kidney failure, sepsis, malignancy), terminally ill patients,pregnancy and those not giving consent for the study were excluded from the study.

Sample Size: Taking prevalence rate of HIV Co-infection with TB in India = 3.4% [22], absolute error as 5% at 95% significance level, estimated sample size by using the formula,

$n = z^2 PQ/L^2$where, n = sample size, z = 1.96, value of standard normal distribution at 95%, Confidence level, P = Prevalence rate of HIV co-infection with TB = 3.4%, Q = (100-P) = 96.6%

L = Absolute error = 5%.Hence, n = 50 which was the sample size for the study.

Study tools

Confirmation of TB by

- Chest X-ray posterior anterior view (CXR PA view)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

- Cartridge-based nucleic acid amplifier test (CBNAAT)
- Sputum for Acid fast bacilli (AFB), Ziehl-Nielsen (ZN) stain and culture
- Confirmation of HIV as per the NACO Guidelines using ELISA/Rapid kit Test
- CD4 count of PLHIV on ART (as per NACO guideline) by automated analyser
- HIV Viral Load by Flourescence Activated single cell sorting (FACS)

Operational definitions

- Microbiologically confirmed TB case- A TB patient who tested positive for acid fast bacilli (AFB) in their biological specimen, or positive for mycobacterium tuberculosis (M. TB) on culture, or through quality assured rapid diagnostic molecular test.
- Clinically diagnosed TB case: TB patient who is not microbiologically confirmed but has been clinically diagnosed with active TB by a clinician on the basis of radiological abnormalities or clinical signs with a decision to treat the patient with a full course of ATT.

Data Collection Procedure: All study participants were subjected to comprehensive questionnaire/ history taking after informed consent, which included like current cough, night sweat, weight loss, fever and were confirmed by and thorough clinical examination as per recommendation of National AIDS Control Programme (NACO), chest Xray, sputum AFB, GeneXpert and culture. Blood samples were sent for CD4 count and HIV viral load.

Statistical Analysis: Statistical package for social sciences (SPSS v22) was used for statistical analysis. Descriptive statistics like mean, median, proportion, standard deviation, frequency, was used to summarize the findings. Analytical statistics like chi-square test and other appropriate methods were used to find if there is any association. A P-value <0.05 was taken as statistically significant.

Approval of Research Ethics Board

Ethical approval for this study was obtained from the Research Ethics Board, Regional Institute of Medical Sciences, Imphal [No.A/206/REB-Comm(SP)/RIMS/2015/1011/42/2023].

RESULTS

The present study recruited a total of 50 study subjects having HIV co-infection with TB. The baseline characteristics of the participants were given in table 1.Most of them weremales (33,66%) while females account for 15(30%) and 2(4%) individuals were transgender (4%).Heterosexual transmission (30,60%) was the most common mode of transmission followed by injecting drug users (IDUs)(14,28%), while parent-to-child transmission and other unspecified modes each constitute (2,4%).Overall, 21(42%) participants have CD4 ≥200, and 29(58%) patients have CD4 <200.The 4s complex was taken positive when two or more symptoms were present (current cough, fever, weight loss and night sweats). 20(40%) individuals are 4S positive, while the remaining 30(60%) exhibit symptoms related to the systems mainly.

Distribution of types of TB and EPTB among HIV-TB co-infection were shown in table 2. PTB alone accounts for 15(30%), while EPTB alone is observed in 14(28%) cases, most commonly affecting the abdomen (21, 42%) followed by pleural effusion (PLEF) at 12(24%.) Neurological involvement was seen in 7(14%), cervical in 6(12%), and mediastinal in 2(4%) patients. Based on diagnostic methods, majority of the subjects were microbiologically confirmed TB (13, 86.7%) while 2(13.3%) were clinically diagnosed. For EPTB, maximum were diagnosed clinically 13(92.9%) and only 1(7.1%) microbiologically confirmed, as shown in table 3.

Among the OIs (20, 40%), oral candidiasis is the most common at 13(26%), followed by genital candidiasis at 3(6%). Ultrasound (USG) findings (based on CD4 counts) showed that 34(68%) of individuals have normal findings while lymphadenopathy (LAP) (12, 24%) is the most common, followed by hepatosplenomegaly (HSM) in (2,4%).Sensitivity to the antitubercular drugs was found in 48(96%) individuals while 2(4%) exhibit resistance. Maximum patients (40,80%) tolerated the treatment without any issues and among the adverse events, gastritis was the most common, affecting 10(20%) patients, as given in table 4.

Distribution of CXR abnormalities as shown in table 5 and zone with side involvement were given in table 6. Normal CXR findings are mostly found inindividuals with a CD4 count ≥200 (8,16%) and the upper zone of lung is maximally affected in those abnormal CXR (10,20%), followed by infiltration at 6(12%), and nodular patterns at 2(4%). Less frequent findings include cavity, consolidation, miliary, effusion, and adenopathy, each seen in 1(2%). In contrast, individuals with a CD4 count <200 exhibit the middle zone involvement (14,28%) with the highest frequency of infiltration at 11(22%), nodular patterns and effusion are seen in 3(6%), while cavity and consolidation are present in 1(2%). Adenopathy and miliary findings were absent in this group. Each the 4S complex shows no significant association with CD4 counts (p=0.45), as its distribution is similar across both CD4 <200 and CD4 ≥200 groups. While there were significant association of CD4 count with OIs (p = 0.03), typical CXR lesions (p = 0.02) and USG findings (p = 0.003), as shown in table 7.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 1: Baseline characteristics of the study subjects (N = 50)

Characteristics	Study subjects (n, %)
Age (in years)	
<20	3(6%)
21-40	17(34%)
41-60	20(40%)
>60	10(20%)
Gender	
Male	33(66%)
Female	15(30%)
Transgender	2(4%)
Routes of transmission	
Heterosexual	30(60%)
Injecting drug users	14(28%)
Blood transfusion	1((2%)
Parent to child transmission	2(4%)
Man who have sex with men(MSM)	1(2%)
Others	2(4%)
CD4 count(cells/cu mm)	
<200	29 (58%)
≥200	21(42%)
Symptoms	
4S positive	20(40%)
Others	30(60%)
Drug resistance to ATT	
Resistance	2(4%)
Sensitive	48(96%)
Other opportunistic infections(OIs)	
Oral candidiasis	13(26%)
Genital candidiasis	3(6%)
Herpes genitalis	1(2%)
Syphilis	1(2%)
HIV retinopathy	2(4%)
No OIs	30(60%)
Haematological abnormalities	
Anaemia	15(30%)
Pancyopenia	2(4%)
Thrombocytopenia	1(2%)
Leucocytosis	1(2%)
No abnormalities	31(62%)
USG findings	
LAP	12 (24%)
HSM	2 (4%)
CLD	1 (2%)
CKD	1 (2%)
Normal	34 (68%)

USG – Ultrasonography, LAP- Lymphadenopathy, HSM- hepatosplenomegaly, CLD- Chronic liver disease,CKD- Chronic kidney disease, ATT- anti tubercular

Table 2: Distribution of types of TB and EPTB among HIV-TB co-infection (N=50)

Parameters	Study subjects (n, %)
Disease form	
-Pulmonary tuberculosis(PTB)	15(30%)
-Extra pulmonary tuberculosis(ETB)	14(28%)
-Combined PTB & ETB	21(42%)
Types of ETB	
-PLEF	12(24%)
-Abdominal	21(42%)
-Cervical	6(12%)
-Mediastinal	2(4%)
-Axillary	1(2%)
-Neurological	7(14%)
-Spinal	1(2%)

PTB- Pulmonary tuberculosis, EPTB- extrapulmonary tuberculosis, PLEF-pleural effusion

Table 3: Distribution of type of TB among HIV-TB co-infection (N=50)

Type of TB	Total	Microbiologically confirmed	Clinically diagnosed
PTB	15	13 (86.7%)	2 (13.3%)
EPTB	14	1 (7.1%)	13 (92.9%)
Combined PTB and EPTB	21	12 (57.2%)	9 (42.8%)

PTB- Pulmonary tuberculosis, EPTB- extrapulmonary tuberculosis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 4: Distribution of adverse events among HIV-TB co-infection (N=50)

Adverse events*	Frequency (n)	Percentage (%)
Gastritis	10	20.0
Giddiness	3	6.0
Iris	2	4.0
DIH	2	4.0
Tolerated	40	80.0

**IRIS- immune reconstitution inflammatory syndrome and DIH -drug-induced hepatitis*

Table 5: Distribution of CXR abnormalities among HIV-TB co-infection subjects (N=50)

CXR findings	CD4 ≥200, n (%)	CD4 count<200, n (%)
Cavity	1 (2.0)	1 (2.0)
Consolidation	1 (2.0)	1 (2.0)
Nodular	2 (4.0)	3 (6.0)
Infiltration	6 (12.0)	11 (22.0)
Miliary	1 (2.0)	0
Effusion	1 (2.0)	3 (6.0)
Adenopathy	1 (2.0)	0
Normal	8 (16.0)	10 (2.0)
Total	21 (42.0)	29 (58.0)

Table 6: Distribution of CXR zone and side involvement among HIV-TB co-infection (N=50)

CXR zone involvement	CD4 ≥200, n (%)	CD4 count <200, n (%)
Diffuse	1 (2.0)	4 (8.0)
Upper	10 (20.0)	3 (6.0)
Middle	6 (12.0)	14 (28.0)
Lower	4 (8.0)	8(16.0)
CXR Side involvement		
Bilateral	5(10%)	10(20%)
Right	16(32%)	19(38%)

Table 7: Association between CD4 count and other parameters (N=50)

Parameters	CD4 count		p-value
	< 200, n (%)	≥200, n (%)	
Other Opportunistic infections	16 (80.0)	4 (20.0)	0.03
4S complex	11(55)	9(45)	0.45
Haematological abnormalities	13 (68.4)	6 (31.6)	0.09
Typical lesions	10 (55.5)	8 (44.5)	0.02
Zone involvement			
Typical	3 (23.0)	10 (77.0)	0.03
Atypical	26 (70.3)	11 (29.7)	
Side involvement			
Bilateral	10 (66.7)	5 (33.3)	0.06
Right	19 (54.3)	16 (45.7)	
USG findings			
With abnormalities	11 (68.7)	5 (31.3)	0.003
Without abnormalities	18 (52.9)	16 (47.1)	
EPTB	23 (65.7)	12 (34.3)	0.03

**4S complex- current cough, fever, weight loss and night sweats, EPTB- extra pulmonary tuberculosis*

DISCUSSION

HIV and TB co-infection is a major public health challenge, in developing countries such as India, more so in the third highest HIV prevalent state of Manipur.A total of 50 HIV TB co- infected patients were enrolled. Majority of the study subjects belonged to 41-60 years age group 20(40%), followed by 17(34%) in the 21-40 years group, which was consistent with the study done in Rishikesh,[22] and Eastern India.[23] The higher prevalence in older individuals reflected the impact of immune senescence and delayed diagnosis, highlighting the need for improved early detection and prevention in these populations.

In the present study, most of them were males (33,66%) while females represented 15(30%), and transgender individuals (under-represented in studies from this region) accounted for 2(4%), which were aligning with studies by Sahoo B et al,[22] and Kapadiya DJ et al.[24] Heterosexual transmission was the most common mode of infection in the present study, accounting for 30(60%), followed by IDUs (14,28%) and parent-to-child transmission (2,4%). A similar trend has been reported in study by Bruchfeld J et al,[25]Pachuau LN et al.[26] The MSM (man who have sex with man)/ homosexuals-related infections in our study corresponds to findings by Safren SA et al.[27] This pattern reflects regional differences in HIV transmission dynamics, suggesting that targeted prevention strategies are needed for specific high-risk groups.

The present study showed 20(40%) individuals with 4S positive (> 2 symptoms of current cough, fever, weight loss and night sweats), while the remaining

ISSN (O): 2687-5365; ISSN (P): 2753-6556

30(60%) exhibit symptoms related to the systems mainly. This was lower when compared with Hamada Y et al,[28] in which screening with 4 symptoms complex (as mentioned above) showed 100% sensitivity and 88% specificity. One possible explanation for the difference in our study could be underreporting of symptoms by patients, either due to a lack of awareness or reluctance to disclose symptoms.

When Mycobacterium tuberculosis (MTB) is inhaled by close contacts, the initial response involves innate immunity, where macrophages, neutrophils, and NK cells attempt to clear the infection. If the infection is not contained, latent TB infection (LTBI) develops, with approximately 95% of cases remaining contained and asymptomatic. In about 5%, active or subclinical TB disease occurs. HIV complicates this process by impairing innate and adaptive immunity, particularly through CD4+ T-cell depletion, facilitating infection establishment, reactivation of LTBI, and reinfection. HIV also increases the likelihood of Tuberculin skin test (TST) or Interferon Gamma release assay (IGRA) reversion in acute or chronic infections, further heightening TB susceptibility.[29]MTB interacts with Toll-like receptors (TLRs) such as TLR2, TLR4, and TLR9 on immune cells, triggering the release of Interleukin (IL-12) and interferon gamma (IFN-γ) to stimulate CD4+ T-cell responses, including T-helper cells (Th1, Th2, Th17) and regulatory T cells (Treg) pathways. This immune activation leads to the production of inflammatory mediators such as tumor necrosis factor (TNF-α), IL-6, and Nuclear Factor kappa-light-chain-enhancer of activated B cells (NF-κB).These inflammatory cytokines have dual consequences: they facilitate increased viral entry into cells and enhance pro-viral budding, driving higher HIV replication rates. Simultaneously, this immune activation creates a favourable environment for viral diversity, contributing to the progression of HIV infection. The bidirectional influence of HIV and MTB, where immune responses to MTB exacerbate HIV replication, worsening the clinical outcomes of co-infection.[30]

The distribution of OIs revealed that 30(60%) individuals were unaffected, likely due to timely ART and effective prevention measures comparable results was reported in a study by Abay SM et al.[31]Oral candidiasis, observed in 13(26%) patients, remains the most common OIs, highlighting its association with declining CD4 counts and delayed ART initiation corroborating findings by Peña DE et al.[32] Genital candidiasis affected 3(6%), showing its impact on quality of life and the need for prompt treatment aligns with Bariha PK et al,[33] Less frequent were HIV retinopathy (2,4%) and herpes genitalis or syphilis (1,2% each), reflecting the declining prevalence of certain OIs with improved ART coverage.

The CXR findings in our study revealed significant differences based on CD4 counts. Among individuals with CD4 ≥200, normal CXRs were most common (8, 16%), consistent with Patel M et al,[34] and Padyana M et al.[35] Infiltration (6, 12%) and nodular patterns (2,4%) and also for CD4 <200, infiltration (11,22%) predominated were comparable to Jaryal A et al,[36] findings therebyhighlighting increased parenchymal involvement in advanced immunosuppression. Zone involvement also varied, with the middle zone most affected (14, 28%) in CD4 <200, similar to observations by Swaminathan Set al.[37]

Our study revealed that 33 (66%) individuals had normal USG findings, and lymphadenopathy (LAP) as the most common abnormality (12, 24%), followed by hepatosplenomegaly (HSM) (2,4%). Chronic liver disease (CLD), chronic kidney disease (CKD), and blood transfusion (BT) were each observed in 1(2%), which were similar to the study by Khan R et al,[38]and Zeng J et al.[39] These studies highlight the utility of USG in identifying HIV-associated abnormalities, particularly in immunocompromised individuals.

This present study found that combined PTB and EPTB was the most prevalent form (21, 42%), followed by PTB alone (15,30%) and EPTB alone (14,28%). Abdominal involvement (21, 42%) was the most common EPTB site, followed by pleural effusion (12,24%), which was consistent with the study done by Hemalatha VS et al [40] (EPTB -20-40% and abdominal TB being predominant in HIV patients). Additionally, Sahukar SB et al,[41] highlighted the variability in EPTB distribution across studies reflects differences in immune status, diagnostic practices, and population characteristics.

Our study found that 13(86.7%) PTB cases were microbiologically confirmed, while 13 (92.9%) EPTB cases were clinically diagnosed, which were similar with the studies conducted by Lam PK et al,[42] and Yang Q et al,[43] who reported lower microbiological confirmation for EPTB due to diagnostic challenges. Treatment was well-tolerated in 40(80%) individuals, consistent with study by Naidoo K et al [44]. Among adverse events, gastritis was the most common (10, 20%), followed by giddiness (3,6%), and severe events like immune reconstitution inflammatory syndrome (IRIS) and drug-induced hepatitis (DIH) (2,4% each). These findings mirror prior studies highlighting the prevalence of gastrointestinal and hepatic side effects during TB treatment.

Our study shows a significant association between USG findings and CD4 counts, with abnormalities more prevalent in individuals with CD4 <200, consistent with previous research by Kyasa et al,[45] highlighting the greater susceptibility to organ dysfunction in advanced immunosuppression. Additionally, the higher incidence of EPTB in individuals with CD4 <200 aligns with findings by BondalapatiPK,[46] who noted that EPTB prevalence increases as immune function declines. These results emphasize the importance of monitoring immune status in HIV/TB co-infected individuals, as severe

ISSN (O): 2687-5365; ISSN (P): 2753-6556

disease manifestations become more likely with declining CD4 counts.

Strengths: The study employed a comprehensive diagnostic approach, combining microbiological, radiological, and clinical methods to ensure accurate identification of HIV/TB co-infections. By adhering to standardized guidelines from NACO and utilizing validated diagnostic tools like CBNAAT and FACS, the study ensured reliability and consistency in its findings. Conducting the research in a high-burden area such as Manipur, where HIV and TB co-infections are prevalent, adds contextual relevance and provides insights that are particularly useful for addressing the challenges.

Limitations: The small sample size participants and the use of convenience sampling may limit the generalizability of the findings to larger populations. Additionally, the cross-sectional design prevents the establishment of causal or temporal relationships between HIV/TB co-infection and other variables. Furthermore, stigma or lack of awareness among participants might have led to underreporting of symptoms, potentially affecting diagnostic accuracy. These limitations highlight the need for larger, longitudinal studies which are multi centric covering various group of people.

CONCLUSION

Our study highlights key clinical insights into HIV/TB co-infection, emphasizing the age and gender distribution, diagnostic challenges, and the spectrum of disease forms and associated complications. The present study concluded higher diagnostic yield for PTB when microbiological confirmation was used, whereas EPTB relied more on clinical diagnosis due to diagnostic limitations. A significant association was observed between radiological features (chest xray, ultrasound findings) with CD4 counts (p=0.003), with a higher percentage of abnormalities in individuals with CD4 <200 (88.2%) compared to those with CD4 ≥200 (57.6%). Furthermore, EPTB was notably more prevalent in individuals with CD4 <200 (p=0.03), highlighting the increased risk of severe disease as immune suppression progresses. These results indicate the crucial role of immune status in shaping the clinical presentation of HIV/TB co-infection. The study findings underscore the necessity for targeted interventions, improved diagnostic methods, and stronger prevention efforts to address this critical public health issue.

REFERENCES

1. WHO report. Global tuberculosis Control. October 2011. Available at: https://www.who.int/publications/i/item/9789241564380 Accessed on: 30th November 2022
2. Sharma SK, Mohan A. Co-infection of human immunodeficiency virus (HIV) and tuberculosis: Indian perspective. Indian J Tuberc. 2004;51:5.
3. Swaminathan S and Narendran G. HIV and tuberculosis in India. J Biosci.2008;33(4): 527–537.
4. Jaiswal RK, Srivastav S, Mahajan H. Socio demographic profile of TB-HIV coinfected patients in Bundelkhand Region, Uttar-Pradesh. Natl J Med Res.2012;2:149-51.
5. Aaron L, Saadoun D, Calatroni I, Launay O, Memain N, et al. Tuberculosis in HIV-infected patients: a comprehensive review. ClinMicrobiol Infect. 2004;10:388–398.
6. Global tuberculosis report 2022. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO.Available at https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2022. Accessed on 20 February 2023
7. Whalen C, Horsburgh CR, Hom D, Lahart C, Simberkoff M, Ellner J. Accelerated course of human immunodeficiency virus infection after tuberculosis. Am J RespirCrit Care Med. 1995;151:129-35.
8. National Technical Guidelines On AntiRetroviral Treatment National AIDS Control Organization Ministry of Health and Family Welfare Government of India, October 2018
9. Bhagyabati DS, Naorem S, Singh TJ, Singh KB, Prasad L, Shantidevi T. HIV and TB Co-infection. Journal, Indian Academy of Clinical Medicine. 2005;6(3): 220-3.
10. RaginiG,EknathN,Beata C, Ricardo I, MarfatiaY.Clinico-epidemiological profile of HIV/TB coinfection patients in Vadodara, Gujarat. Indian J Sex Transm Dis & AIDS. 2009;30(1): 10-5.
11. Rajasekaran S, Mahilmaran A, Annadurai S, Kumar S, Raja K. Manifestation of tuberculosis in patients with human immunodeficiency virus: a large Indian study. Annals of Thoracic Medicine. 2007 Apr 1;2(2):58-60.
12. Lillebaek T, Dirksen A, Vynnycky E, Baess I, Thomsen VO, et al. Stability of DNA patterns and evidence of Mycobacterium tuberculosis reactivation occurring decades after the initial infection. J Infect Dis 2003;188: 1032–1039.
13. Lewinsohn DA, Winata E, Swarbrick GM, Tanner KE, Cook MS, et al.Immunodominant tuberculosis CD8 antigens preferentially restricted by HLAB. PLoS200;3:e127. doi:10.1371/journal.ppat.0030127.
14. Lewinsohn DA, Heinzel AS, Gardner JM, Zhu L, Alderson MR, et al.Mycobacterium tuberculosis-specific CD8+ T cells preferentially recognize heavily infected cells. Am J RespirCrit Care Med. 2007;168:1346–1352.
15. Van Pinxteren LA, Ravn P, Agger EM, Pollock J, Andersen P. Diagnosis of tuberculosis based on the two specific antigens ESAT-6 and CFP10. ClinDiagn Lab Immunol. 2000;7:155–160.
16. Chen CY, Huang D, Wang RC, Shen L, Zeng G, Yao S, et al. A critical role for CD8 T cells in a nonhuman primate model of tuberculosis. PLoS pathogens. 2009 Apr 17;5(4):e1000392.
17. Rosas-Taraco AG, Arce-Mendoza AY, Caballero-Olín G, Salinas-Carmona MC. Mycobacterium tuberculosis upregulates coreceptors CCR5 and CXCR4 while HIV modulates CD14 favoring concurrent infection. AIDS Research & Human Retroviruses. 2006 Jan 1;22(1):45-51.
18. Spear GT, Kessler HA, Rothberg L, Phair J, Landay AL. Decreased oxidative burst activity of monocytes from asymptomatic HIV-infected individuals. Clinical immunology and immunopathology. 1990 Feb 1;54(2):184-91.
19. Wahl SM, Allen JB, Gartner S, Orenstein JM, Popovic M, Chenoweth DE, et al. HIV-1 and its envelope glycoprotein down-regulate chemotactic ligand receptors and chemotactic function of peripheral blood monocytes. Journal of immunology (Baltimore, Md.: 1950). 1989 May 15;142(10):3553-9.
20. Havlir DV, Barnes PF. Tuberculosis in patients with human immunodeficiency virus infection. New England journal of medicine. 1999 Feb 4;340(5):367-73.
21. Patel NR, Zhu J, Tachado SD, Zhang J, Wan Z, Saukkonen J, Koziel H. HIV impairs TNF-α mediated macrophage apoptotic response to Mycobacterium tuberculosis. The Journal of Immunology. 2007 Nov 15;179(10):6973-80.
22. Sahoo B, Kamboj P, Anand P, Mathuria YP, Bairwa M, Prasad A. The prevalence of Tuberculosis in HIV patients and their correlation with CD4+ count in a tertiary care

ISSN (O): 2687-5365; ISSN (P): 2753-6556

hospital in Rishikesh, gateway to the Himalayas. Indian Journal of Tuberculosis. 2024 Oct 10.
23. Manjareeka M, Nanda S. Prevalence of HIV infection among tuberculosis patients in Eastern India. Journal of infection and public health. 2013 Oct 1;6(5):358-62.
24. Kapadiya DJ, Dave PV, Vadera B, Patel PG, Chawla S, Saxena D. Assessment of tuberculosis prevalence in newly diagnosed human immunodeficiency virus-infected adults attending care and treatment center in Gujarat, India. Indian Journal of Community Medicine. 2018 Jul 1;43(3):185-9.
25. Bruchfeld J, Correia-Neves M, Källenius G. Tuberculosis and HIV Coinfection. Cold Spring HarbPerspect Med. 2015 Feb 26;5(7):a017871.
26. Pachuau LN, Tannous C, Dhami MV, Agho KE. HIV among people who inject drugs in India: a systematic review. BMC Public Health. 2022 Aug 10;22(1):1529.
27. Safren SA, Thomas B, Biello KB, Mayer KH, Rawat S, Dange A, et al. Strengthening resilience to reduce HIV risk in Indian MSM: a multicity, randomised, clinical efficacy trial. Lancet Glob Health. 2021 Apr;9(4):e446-e455.
28. Hamada Y, Lujan J, Schenkel K, Ford N, Getahun H. Sensitivity and specificity of WHO's recommended four-symptom screening rule for tuberculosis in people living with HIV: a systematic review and meta-analysis. The lancet HIV. 2018 Sep 1;5(9):e515-23.
29. Bell LCK, Noursadeghi M. Pathogenesis of HIV-1 and Mycobacterium tuberculosis co-infection. Nat Rev Microbiol. 2018 Feb;16(2):80-90.
30. Sia JK, Rengarajan J. Immunology of Mycobacterium tuberculosis Infections. MicrobiolSpectr. 2019 Jul;7(4):10.
31. Abay SM, Deribe K, Reda AA, Biadgilign S, Datiko D, Assefa T, et al. The effect of early initiation of antiretroviral therapy in TB/HIV-coinfected patients: a systematic review and meta-analysis. Journal of the International Association of Providers of AIDS Care (JIAPAC). 2015 Nov;14(6):560-70.
32. Peña DE, Innocentini LM, Saraiva MC, Lourenco AG, Motta AC. Oral candidiasis prevalence in human immunodeficiency virus-1 and pulmonary tuberculosis coinfection: A systematic review and meta-analysis. Microbial Pathogenesis. 2021 Jan 1; 150:104720.
33. Bariha PK, Mohapatra MK, Mohanty PK, Kullu BK, Pujari UC. Clinico-Epidemiological Profile of Opportunistic Infections Among Hiv Infected Patients InVss Institute Of Medical Science & Research (Vimsar), Burla, Dist. Sambalpur, Odisha.IOSR Journal of Dental and Medical Sciences (IOSR-JDMS);17(4):17-29.
34. Patel M, Singh R, Kumar A. Radiographic patterns in HIV-positive individuals. J ClinRadiol. 2020;15(2):123-30.
35. Padyana M, Bhat RV, Dinesha M, Nawaz A. HIV-tuberculosis: a study of chest x-ray patterns in relation to CD4 count. North American journal of medical sciences. 2012 May;4(5):221.
36. Jaryal A, Raina R, Sarkar M, Sharma A. Manifestations of tuberculosis in HIV/AIDS patients and its relationship with CD4 count. Lung India. 2011 Oct 1;28(4):263-6.
37. Swaminathan S, Narendran G, Menon PA, Padmapriyadarshini C, Arunkumar N, Sudharshanam NM, et al. Impact of HIV infection on radiographic features in patients with pulmonary tuberculosis. Indian Journal of Chest Diseases and Allied Sciences. 2007;49(3):133-6.
38. Khan R, Abid S, Jafri W, Abbas Z, Hameed K, Ahmad Z. Diagnostic dilemma of abdominal tuberculosis in non-HIV patients: an ongoing challenge for physicians. World journal of gastroenterology: WJG. 2006 Oct 10;12(39):6371.
39. Zeng J, Zhou G, Pan F. Clinical analysis of intestinal tuberculosis: a retrospective study. Journal of Clinical Medicine. 2023 Jan 5;12(2):445.
40. Hemalatha VS, Thaliath ZX, Somson HT. Comparison of Pulmonary Tuberculosis and Extra Pulmonary Tuberculosis in a Tertiary Care Setting. Int J Acad Med Pharm. 2023;5(1):225-8.
41. Sahukar SB, Palani VK, Ranganathan R, Kumpthala S. Clinical profile of extra pulmonary tuberculosis: A retrospective south Indian study.
42. Lam PK, Catanzaro A, Perry S. Diagnosis of pulmonary and extrapulmonary tuberculosis. InTuberculosis 2016 Apr 19 (pp. 97-128). CRC Press.
43. Yang Q, Han J, Shen J, Peng X, Zhou L, Yin X. Diagnosis and treatment of tuberculosis in adults with HIV. Medicine. 2022 Sep 2;101(35):e30405.
44. Naidoo K, Hassan-Moosa R, Mlotshwa P, Yende-Zuma N, Govender D, Padayatchi N, et al. High rates of drug-induced liver injury in people living with HIV coinfected with tuberculosis (TB) irrespective of antiretroviral therapy timing during antituberculosis treatment: results from the starting antiretroviral therapy at three points in TB trial. Clinical Infectious Diseases. 2020 Jun 10;70(12):2675-82.
45. Kyasa SV, Achuta KM, Gupta MK, Ajmeera R, Kancherla N, Singh F. Assessment of the USG Detection of Abdominal Pathologies in HIV and Aids and its Association with CD4 Counts - An Original Research. J Pharm Bioallied Sci. 2023 Jul;15(Suppl 1):S262-S267.
46. Bondalapati PK. A study on patients with TB and HIV co-infection in relation to mean CD4 counts. Indian Journal of Pharmacy Practice. 2017 Apr;10(2):111.

ISSN (O): 2687-5365; ISSN (P): 2753-6556