ORIGINAL PAPER

Clinico-demographic profile of patients with HIV/tuberculosis co-infection from western Gujarat, India: a retrospective study

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Abstract

Introduction: Human immunodeficiency virus (HIV)/tuberculosis (TB) co-infection has become huge barrier to achieving TB control in the world. TB, despite being discovered in 1882, remains a major public health problem in many developing countries. The problem is now further complicated by persistent spread of HIV, which causes acquired immunodeficiency syndrome (AIDS). This study attempted to describe the underlying correlates of HIV/TB co-infection.

Material and methods: A retrospective study in the Department of Tuberculosis and Chest Disease at a tertiary care teaching hospital was conducted from January 2011 to December 2019, among 622 patients co-infected with HIV and TB from ART center of G. K. General Hospital in Kutchh, Bhuj, India. Demographic details were collected, including age, sex, symptoms at presentation, mode of transmission, occupation, residence, TB details (diagnosis, type of TB, CBNAAT results, and CD4+ count at TB detection), details of antiretroviral therapy and anti-TB treatment, and treatment outcomes.

Results: The diagnosis of pulmonary TB (71.86%, n = 447) dominated in the population sampled, followed by extra-pulmonary TB (28.14%, n = 175), with predominant pulmonary TB being observed throughout the study duration. The rate of HIV/TB co-infection in this study was found to be higher among males (78.7%, n = 490) in the sexually active age group of 31-40 years (37.45%, n = 175), living in rural areas (54.51%, n = 339), and laborers by occupation (17.68%, n = 110). In line with studies across India, the heterosexual route was the main way of transmission in this population (n = 556) at 89.38%.

Conclusions: The prevalence of HIV/TB co-infection was higher in sexually active married males with poor education, laborers by occupation, living in rural areas, and of lower socio-economic class. HIV/TB co-infection was observed to be associated with reduced CD4+ counts, which could fasten the progression to AIDS. Health interventions should mainly focus on the rural population, as 54.5% of HIV/TB co-infected persons were living in rural areas. Awareness campaigns should address this high-risk inhabitants along with aggressive case finding.

HIV AIDS Rev 2026; 25, 2: 123-127
DOI: https://doi.org/10.5114/hivar/186703

Key words: HIV, TB, co-infection, CD4+.

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Article history:
Received: 31.12.2023
Revised: 20.01.2024
Accepted: 02.04.2024
Available online: 16.03.2026

International Journal of HIV-Related Problems
HIV & AIDS Review

Introduction

Gujarat has the largest coastline providing occupation to a large number of workers, including the migrants labors from different parts of India. Ports of Kutch include Mundra, Kandla, Mandvi, and Jakhau. Ports of Kutch District are dealing with the main outland ports of western India. Human immunodeficiency virus (HIV) prevalence among male migrants was estimated as 0.99% in 2008-2009, which was three times higher than in the general population [1-4].

The rapid growth of HIV epidemic in many countries of the world resulted in equally dramatic rise in the estimated number of new tuberculosis (TB) cases. The prevalence of HIV-related TB continues to increase even in the countries with well-organized national TB control programs, which are successfully implementing internationally recommended strategy for TB control [5]. The combination of the two has proven to have a far greater impact on the epidemiologic progression and consequently, on global health. The HIV/TB co-infection is also known as "accursed duet" [6].

TB is one of the most common comorbid infection seen in HIV-positive patients that contribute to significant morbidity and mortality throughout the world, especially in developing countries, such as India. Overall, HIV-infected patients have an 8-fold greater risk of TB than non-HIV people [6]. It is estimated that around 60-70% of patients with HIV will develop TB in their lifetime [7]. In two outbreaks, in which HIV-infected persons are exposed to infectious TB, 40% of HIV-positives will developed active TB within a few months [8]. In HIV-infected individuals, active TB seems to develop soon after infection and progress rapidly, often resulting in death [8-10]. In 2015, there were an estimated incidence of 10.2 million HIV cases globally, of which, 1.2 million were HIV/TB co-infection cases (11%) [11]. The detection of TB in HIV-infected patients is difficult due to atypical presentation and frequent smear-negative microscopy resulting from lack of caseous necrosis [12]. Clinical presentation and clinical forms of TB in HIV patients partly depends on CD4+ counts, so it is important to investigate the impact of CD4+ counts and development of TB in HIV-positive patients. HIV/TB co-infection has become a huge barrier to achieving TB control in India [13-16]. While TB emerges as a deadly counterpart in the HIV epidemiology, there is an urgent need to understand possible multifactorial associations with this co-infection. This study attempted to describe the underlying correlates of HIV/TB co-infection.

Material and methods

A retrospective study was conducted in the Department of Tuberculosis and Chest Disease in a tertiary care teaching hospital from January 2011 to December 2019. Data of all HIV/TB-diagnosed patients from ART center were collected, including demographic details, such as age, sex, symptoms at presentation, mode of transmission, occupation, residence, details of TB diagnosis with type of TB and CBNAAT results, CD4+ count at TB detection, details of antiretroviral therapy (ART) and anti-tuberculosis treatment (ATT), and treatment outcomes.

CD4+ counts were assessed using flow cytometry with fluorescence-activated cell sorting (FACS) unit and FACSCount™ reagent. HIV testing was performed in NACO-approved government laboratory using the immunochromatography technique, and TB diagnosis was done by GeneXpert, manufactured by Cepheid, Sunnyvale, USA. Single, early morning sputum sample was taken in a sterile falcon tube, and then tested according to the GeneXpert system operator manual provided by the Central TB Division, India.

Statistical analysis

Descriptive data were presented as frequencies (percentages) for discrete variables and means (SD) for continuous variables.

Results

Between January 2011 and December 2019, 622 patients infected with HIV and TB were registered at ART center. The Integrated Counseling and Testing Center (ICTC) emerged as the key entry point for patients to the ART center.

All patients were screened for pulmonary TB (PTB) and extra-pulmonary TB (EPTB), with physical and sputum AFB examinations, X-ray chest, abdomen ultrasound, lymph node inspection, and magnetic resonance scans of the brain. Details of patients diagnosed with active TB and presenting to the ART center were reviewed. The diagnosis of PTB (71.86%, n = 447) was higher in the population sampled, followed by EPTB (28.14%, n = 175), with PTB being observed higher throughout the study duration. All co-infected patients were treated with ATT under Revised National Tuberculosis Control Program (RNTCP), and directly observed treatment, short-course (DOTS). HIV infection was diagnosed at the center using three antibody tests according to the guidelines of National AIDS Control Organization (NACO).

Socio-demographic profile

In the current study, HIV/TB co-infection was found to be higher among males (78.7%, n = 490) in the sexually active age group of 31-40 years (37.45%, n = 175), habitants of rural areas (54.51%, n n = 339), and laborers by occupation (17.68%, n = 110). In line with studies across India [15], the heterosexual route of transmission dominated in this population (n = 556) at 89.38% (Tables 1-6).

Clinico-epidemiological profile

ART was started in accordance with the National ART guidelines. In this study, 89.2% of patients were on ART and 10.8% were on pre-ART. Adherence to treatment was fair, and minimal loss to follow-up of more than 3 months (2.3%,

n = 14) was observed among those on treatment, with main cause being death (18.9%, *n* = 129) (Table 7).

Under the RNTCP guidelines, DOTS was initiated according to weight band.

Discussion

The current study focused on assessing the profile of individuals with HIV/TB co-infection. A total of 622 HIV/AIDS-

Table 1. Time duration between human immunodeficiency virus (HIV) diagnosis and development of tuberculosis (TB)

TB detected	Present study, *n* (%)	Girardi *et al.*, *n* (%)
≤ the time of HIV diagnosis	326 (52.4)	84 (31.0)
1-6 months from HIV diagnosis	93 (14.9)	104 (38.0)
> 6-12 months from HIV diagnosis	203 (63.0)	85 (31.0)

Table 2. Age-wise sex distribution of human immunodeficiency virus (HIV)/tuberculosis (TB) co-infected patients

Age group (years)	Male	Female	Transgender	Total	Percentage
0-10	7	4		11	1.76
11-20	14	5		19	3.05
21-30	115	32	1	148	23.79
31-40	179	54		233	37.45
41-50	110	26		136	21.86
51-60	50	9		59	9.48
61-70	15	1		16	4.18
71-80	0	0		0	0
81-90	0	0		0	0
91-100	0	0		0	0
Total	490	131	1		

Table 3. Transmission mode of human immunodeficiency virus (HIV) in HIV/tuberculosis co-infected patients

Mode of transmission	*n* (%)
Sexual	556 (89.38)
Blood	20 (3.21)
Vertical	25 (4.03)
Unknown	21 (3.37)
Total	622 (100.0)

Table 4. Occupation of study participants

Occupation	*n* (%)
Farmer	70 (11.25)
Laborer	110 (17.68)
Truck driver	57 (9.16)
Housewife	107 (17.20)
Student	12 (1.92)
Other services	237 (38.10)
Other/unemployed	29 (4.66)

Table 5. Type of tuberculosis of study participants

Type	*n* (%)
Pulmonary	447 (71.86)
Extra-pulmonary	175 (28.14)

Table 6. Area of residence of study participants

Area	*n* (%)
Urban	283 (45.49)
Rural	339 (54.51)

Table 7. CD4+ counts of study participants

Counts	Pulmonary (*n*)	Extra-pulmonary (*n*)	Total (*n*)
< 100	141	56	197
100-199	104	44	148
200-299	73	24	97
300-399	51	22	73
400-499	27	9	36
> 500	51	20	71
Total	447	175	622

infected patients reporting to the ART center of G K General Hospital, Kutch District, between January 2011 and December 2019 were included. Of these, higher prevalence of HIV/TB co-infection was found among sexually active males, with poor education, married, laborers by occupation, living in rural areas, and of lower socio-economic class. These socio-demographic findings are comparable with other studies conducted in India [17-20].

The results of the study showed that the heterosexual route of transmission was the most common, indicating the need for intervention targeted at behavior modification [21]. The mean CD4+ count in this population at presentation was 51.83 cells/dl (median: 156, range: 18-755).

HIV/TB co-infection is associated with lower CD4+ counts than in those living with HIV only, which leads to increased morbidity and HIV progression to AIDS. Several studies have reported that CD4+ counts are lower among HIV/TB co-infected patients as compared with HIV-infected individuals, and severe immune suppression was observed in those with CD4+ count below 200 cells/dl [22, 23]. ATT has been reported to have a positive influence on CD4+ counts [30], and DOTS initiative has been demonstrated to prevent and even reduce the emergence of multidrug-resistant (MDR)-TB [24]. It is important to note that an increasing trend in the proportion of HIV/TB cases in this population from 10.6% (in 2008) to 31.3% (in June 2012) was also observed in this study. In the WHO report of 2008, only 4% of Indian individuals with TB got tested for concurrent HIV infection, which may be re-analyzed after findings emerging from the current study. The Centers for Disease Control (CDC) has stated that TB is one of the few HIV-related opportunistic infections that is both preventable and curable [25]. As observed in the present study, treatment of HIV and TB co-existing conditions has a favorable outcome with reduced risk of mortality, in line with a study by Cain *et al*. [26]. Nevertheless, this rising trend needs to be further investigated to identify other factors.

Conclusions

The prevalence of HIV/TB co-infection was higher in sexually active males with poor education, married, laborers by occupation, habitants of rural areas, and of lower socio-economic class. HIV/TB co-infection was observed to be associated with reduced CD4+ counts, which could fasten the progression to AIDS. Therefore, physicians treating HIV-infected patients should identify cases with TB in order to reduce the associated comorbidity resulting from the pairing of the infections. Health interventions should focus on the rural population, as 54.5% of those co-infected were living rural areas in this study. Also, awareness campaigns should address this high-risk inhabitants along with aggressive case finding, as it may be the solution in prevention and early detection of HIV/TB co-infection cases.

Disclosures

1. Institutional review board statement: This study was approved by the Ethics Committee of the Gujarat Adani Institute of Medical Sicences G.K. General Hospital, Bhuj, Gujarat, India (approval number: GAIMS/IEC/APPROVAL/2026/08).
2. Assistance with the article: None.
3. Financial support and sponsorship: None.
4. Conflicts of interest: None.

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