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Original Research Article

A Study on HIV-TB Coinfection among Patients Attending a Tertiary Care Centre in North East India

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ABSTRACT

Introduction: HIV and TB can individually be the major causes for public health threats and the combination of the two has proven to have a far greater impact on the epidemiologic progression and consequently on the global health scene. Due to this relationship there has been a dramatic increase in the incidence of tuberculosis in countries with high prevalence of HIV and TB.
Objectives: To understand the prevalence of HIV-TB coinfection among patients attending a Tertiary Care Centre in North East India and assessment of the risk factors for HIV-TB coinfection.
Materials and Method: The study was conducted in two groups of patients attending Integrated Counseling and Test Centre (ICTC) under National AIDS Control Organization (NACO) and Designated Microscopy Centre (DMC) under RNTCP were included. Prevalence of HIV-TB coinfection and risk factors for coinfection were estimated.
Results: A total of 6786 clients attending ICTC and 2651 patients attending DMC of which 86 (1.26%) were positive for HIV, 253(9.54%) were positive for pulmonary TB, and 12(0.13%) had HIV-TB coinfection respectively. Prevalence of coinfection was more common among males sexually active age group. Substance abuse, illiteracy and truck drivers by occupation were found to be risk factors for coinfection in comparison to other similar studies.
Conclusion: HIV-TB coinfection represents a novel pathogenic scenario at the global level. It constitutes a serious diagnostic and therapeutic challenge particularly in poor countries. In our study, we found that prevalence of HIV-TB coinfection was lower in contrast to many studies where the prevalence was higher.

Keywords: Coinfection, Prevalence, HIV, TB, Risk factors

INTRODUCTION

Tuberculosis is a disease of great antiquity and has almost certainly caused more suffering and death than any other infection. The Vedas and other ancient Hindu texts have termed this disease as Raja Yakshama- the king of diseases- and it afflicted Neolithic man and pre-Columbian American Indians. [1]

Tuberculosis is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extrapulmonary TB). The disease is spread in the air when people who are sick

with pulmonary TB expel bacteria, for example by coughing. [2] It is one of the most common causes of death from infectious disease at the global level being second only to HIV/AIDS. Most deaths occur in the developing countries, affect the young in their productive years of their life. [3]

Human immunodeficiency virus infection has become a pandemic far more extensive than what was predicted even a decade ago. The global spread has been so swift that no country has been spared and the pace of the epidemic is increasing in India. [4] Tuberculosis remains the most common opportunistic infection and is the commonest cause of death in HIV infected patients. Clinical presentation of TB in early HIV infection resembles to that observed in immuno-competent persons but in later stage, the clinical presentation of TB can be atypical. Coinfection with HIV leads to challenges in both diagnosis and treatment of tuberculosis. Diagnosis of TB in HIV infected patients may be delayed because of atypical clinical presentation and involvement of inaccessible sites and low sputum smear positivity. [5] 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. The treatment of coinfected patients requires antituberculosis and antiretroviral drugs administered concomitantly

TB is the most common serious opportunistic infection in HIV positive patients and is the manifestation of AIDS in more than 50% of cases in developing countries. 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. The higher mortality is due to the progression of AIDS rather than TB probably due to the fact that *M. tuberculosis* increases viral replication. [6]

While HIV and TB can individually be the major causes for public health threats, the combination of the two has proven to have a far greater impact on the epidemiologic progression and consequently on the global health scene. The dual infection has been termed "the cursed duet." [7]

In persons dually infected with HIV and tuberculosis, the lifetime risk of developing tuberculosis is 50%-70% as compared to a 10% risk in HIV negative individuals. [6] Due to this relationship there has been a dramatic increase in the incidence of tuberculosis in countries with high prevalence of HIV and tuberculosis. [8]

The 2009 report of UNAIDS estimated that 33.4 million people are living with HIV/AIDS with a third of them showing co infection with TB. Globally, about 14.8% of patients with TB are co infected with HIV. [9] About one in four deaths among people living with HIV are reportedly because of TB. A 2010 report by the WHO reported that 360,000 people had died with active TB and HIV infection, indicating an increase from 2010 to 2011. [10] There is wide variation in HIV seropositivity among TB patients in India, ranging from 9.4% in New Delhi to 30% in Mumbai. [11] In a study in Manipur by S Bhagyabati Devi *et al.*, TB was found in 55% of HIV infected patients compared to 25% in seronegative patients. [12]

Coinfection of HIV and TB is intricately and causally associated with malnutrition, unemployment, alcoholism, drug abuse, poverty, homelessness and illiteracy. [13] Among the risk factors for coinfection, 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. [12] It is more common in sexually active age group and heterosexual transfer is the commonest mode of HIV infection. [14] With the emergence of TB as a lethal counterpart in the epidemiology of HIV, there is an urgent need to understand possible multifactorial

associations to this partnership. This study attempts to understand prevalence of HIV-TB coinfection and the risk factors for developing HIV-TB coinfection.

MATERIALS AND METHODS

The present study was conducted in the Department of Microbiology, in a Tertiary Care Centre in North East India over a period of one year from Jan 2013 to Dec 2013. Ethical clearance was duly obtained from the Institute Ethical Committee for conducting the study.

Samples were collected from patients attending Integrated Counselling and Test Centre (ICTC) & DOTs clinic of the hospital referred from various OPD & Indoors Clinical samples including blood and sputum were taken from the from the patients following the guidelines of NACO & RNTCP India after obtaining due informed consent.

Study design:

1) Study conducted in two groups of patients:

a) Attending ICTC: After pre-test counselling and obtaining informed consent, patients underwent HIV testing which was performed as per NACO, Government of India, guidelines to detect antibodies to HIV- 1 and HIV-2 in the serum, as per strategy III. [15] Any patient having symptoms suggestive of TB like cough of more than two weeks, fever, weight loss, night sweats etc. were referred to DOTs clinic for further evaluation. [16]

b) Attending DOTs clinic: Patients presenting with sign and symptoms of TB were subjected to sputum smear microscopy employing fluorescent microscope at DOTs clinic. Any patient having high risk behaviour, other sexually-transmitted infections, or opportunistic conditions suggestive of HIV infection were referred to ICTC for further evaluation.

2) Specimen collection & lab testing:

a) Patients attending ICTC: 2-3ml blood collected aseptically in a clean sterile tube for HIV testing after counseling and obtaining due informed consent. The collected sample was tested for HIV antibody (HIV1/HIV2) using rapid diagnostic test kits following the NACO, India guidelines. The kits used were COMB AIDS, PAREEKSHAK TRILINE, SD BIOLINE HIV- ½.

b) Patients attending DOTS clinic: Two numbers of sputum sample was collected in sterile leak-proof, disposable, appropriately labeled containers without any fixatives as per RNTCP guidelines. [17] The collected specimens was subjected for demonstration of AFB using fluorescent microscopy employing Auramine O stain and grading was done accordingly

Statistical analysis: The data accrued on all HIV-TB coinfected patients was tabulated in Microsoft Office Excel software and analysed using MedCalc for Windows, Version 12.5 (MedCalc software, Ostend, Belgium) and the significance of p value was determined if it's less than 0.05.

OBSERVATIONS AND RESULTS

A total of 6786 clients were registered in ICTC in a Tertiary Care Centre during the study period where 86(1.26%) were detected with positive HIV status employing Rapid test following NACO guidelines. Clients with suspected Pulmonary TB comprising of 50(58.1%) numbers of HIV positive status were referred to Designated Microscopy Centre (DMC) for sputum examination to detect Acid Fast Bacilli following RNTCP guidelines. Sputum smear were positive for 10 (11.6%) of such clients. A total of 2651 patients attended DMC under RNTCP where 253(9.54%) were positive for examination of Acid Fast Bacilli. Patients with risk factors for HIV comprising 115(45.4%) numbers were referred to ICTC where 2 (0.79%) were detected HIV positive which is depicted in Table-1.

Table-1: Distribution of study groups with status of HIV and TB coinfection among patients attending a Tertiary Care Centre in North East India

Category	Total case	Positive	Referred ICTC/DMC	TB+HIV
ICTC	6786	86(1.26%)	50(58.1%)	10(11.6%)
DMC	2651	253(9.54%)	115(45.4%)	2(0.79%)
TOTAL	9437			12(0.13%)

The Table1 indicated that considerable number of clients (11.6%) with HIV had co-infection with TB whereas patients with pulmonary TB had coinfection with HIV only in 0.79% in our study which was statistically significant p value 0.02 (p value <0.05).

In our study 58(67.4%) were male and 28(32.5%) were female clients with HIV positive status group of which 50 clients comprising of 32(64%) male and 18 (36%) female were referred to DMC for detection of sputum Acid Fast Bacilli where 10(100%) clients consisting only of males were tested positive. Acid Fast Bacilli were demonstrated in 153(60.4%) male and 100(39.5%) female among 253 TB patients. Patients with suspected HIV infection comprising of 80(69.6%) male and 35(30.4%) female were referred to ICTC where only 2 comprising 1(50%) male and 1(50%) female was positive for HIV as indicated in Table-2. In our study it was observed that there was male pre-ponderence (91%) in HIV-TB group which was statistically not significant p value 0.16 (p value>0.05)

Table-2: Sex wise distribution of the study groups with status of HIV and TB coinfection among patients attending a Tertiary Care Centre in North East India

Sex	HIV	TB	Referred to DMC	Referred to ICTC	TB+HIV
Male	58(67.5%)	153(60.5%)	32(64%)	80(69.6%)	11(91.7%)
Female	28(32.5%)	100(39.5%)	18(36%)	35(30.4%)	1(8.3%)
Total	86	253	50	115	12

Highest number of HIV positive cases, Pulmonary TB cases and HIV-TB coinfection cases were in the age group 21-40 years comprising of 60,138,10 numbers respectively as depicted in Table-3 which was not statistically not significant.

Table-3: Age wise distribution of the study groups with status of HIV and TB coinfection among patients attending a Tertiary Care Centre in North East India

Age group (In years)	HIV		TB		HIV +TB
	+	Referred	+	Referred	+
<20	2	1	37	17	0
21 to 40	60	32	138	62	10
41 to 60	22	16	56	24	2
>61	2	1	22	12	0
Total	86	50	253	115	12

RISK FACTORS OF HIV-TB COINFECTION:

1. Substance Abuse

Substance abuse was highest in number 11 cases (91%) in TB-HIV co infection group followed by 61cases (67%) in HIV group and least 152 cases (58%) in TB group as shown in Table-4

Among the substance abuse, smoking was statistically significant with p value of 0.004 and drug abuse was also statistically significant with p value of 0.01.

Table-4: Distribution of Substance abuse among study groups with status of HIV and TB coinfection among patients attending a Tertiary Care Centre in North East India

	Substance abuse	TB		HIV		TB+HIV	
Present	Smoking	121(79.6%)	153 58%	37(60.^%)	61 67%	11(100%)	11 91%
	Alcoholism	89(58.5%)		36(59%)		9(81.5%)	
	Drug user	0(0%)		5(8.2%)		4(36.4%)	
Absent		101942%)		25(33%)		1(9%)	

2. Occupation

Highest number of truck drivers by occupation 6(50%) was seen in HIV-TB coinfection group followed by 35(40.7%) in HIV positive group and 8(3.2%) in pulmonary TB patients. In the pulmonary TB group highest number of patients 120(47.4%) belong to others which includes housewives, shopkeepers, teachers as shown in Table-5 which was not statistically significant.

3. Socioeconomic status:

Highest number of HIV positive cases, pulmonary TB cases and HIV-TB coinfection cases comprising of 64,183, 9 in numbers belonged to lower class respectively as shown in Table-6 which was not statistically significant.

Table-5: Distribution of study group by occupation with status of HIV and TB coinfection among the patients attending a Tertiary Care Centre in North East India

Occupation	TB	HIV	TB+HIV
Truck Driver	8(3.2%)	35(40.7%)	6(50%)
Student	49(19.4%)	3(3.5%)	0
Others	120(47.4%)	35(40.7%)	3(25%)
Industrial worker	76(30%)	13(15.1%)	3(25%)

Table-6: Distribution of study groups by Socioeconomic status with status of HIV and TB coinfection attending a Tertiary Care Centre in North East India

Socioeconomic Status	HIV	TB	TB+HIV
High	0	2	0
Low	64	183	9
Middle	22	68	3
Grand Total	86	253	12

4. Education

Highest prevalence of illiteracy 10 (83%) in the HIV-TB coinfection group, followed by 68 (78%) in the HIV positive group and least 134(51%) was seen in Pulmonary TB group as depicted in Fig.1 which was not statistically significant.

5. Marital Status

The distribution of married and unmarried person was equal 1:1 in the HIV-TB coinfection group whereas, in HIV positive cases the ratio was 1.96:1 and in the TB group it was 1.29:1 as shown in the Fig.1 which was not statistically significant.

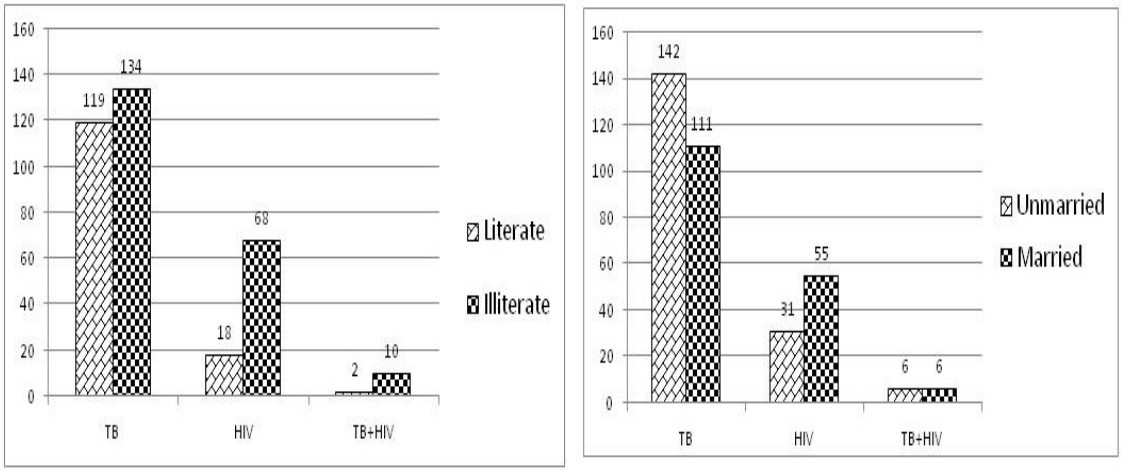

Fig1.Distribution of study groups by education status and marital status with status of HIV and TB coinfection

DISCUSSION

The present study was a hospital based observational study conducted in the Department of Microbiology, in a Tertiary Care Centre in North East India for a period of one year from January 2013 to December 2013. The main objectives of this study were to understand the prevalence of HIV-TB coinfection among patients attending the Tertiary Care Centre and assessment of the risk factors for HIV-TB coinfection

Our study was conducted in two groups of patients. In one group a total of 6786 clients attending ICTC, were included where 86(1.26%) were detected with positive HIV status by employing Rapid test following NACO guidelines. Clients with suspected Pulmonary TB comprising of 50(58.1%) numbers of HIV positive status were referred to DMC for sputum examination to detect Acid Fast Bacilli following RNTCP guidelines. Sputum smears were positive for 10 (11.6%) of such clients. In the second group a total of 2651 patients attending DMC under RNTCP were included where 253(9.54%) were positive for examination of AFB. Patients with risk factors for HIV comprising 115(45.4%) numbers were referred to ICTC where 2 (0.79%) were detected HIV positive.

The study showed 12 patients (0.13%) had HIV-TB coinfection among 6786 clients attending ICTC and 2651 patients DOTs clinic in a Tertiary Care Centre in North East India. The result of the present study is comparable to the reports of Sharma SK *et al.*, [18] 2000(0.4%), Banavalikar JN *et al.*, [19] 1999(0.5%), Rajasekharan S *et al.*, [20] 2000(0.59%), Wang L *et al.*, [21] 2010 (0.5%) However some studies showed higher prevalence rate, Mohanty KC *et al.*, [22] 1995 (26.70%),

Samuel NM *et al*., [23] 1996 (17%), Paranjape RS *et al*., [24] 1997(15%). This can be explained by the fact that in our study we included the total population attending ICTC and DOTS whereas in many of the studies it was restricted to either TB or HIV positive population for which such higher prevalence was reported.

In our study it was observed that in HIV positive clients male patients comprised 67.5% compared to females 32.5% which indicated male preponderance. Pulmonary TB was found in 60.5% of male patients compared to 39.5% of females, which also indicated male preponderance and in HIV-TB coinfection group 91.67% were males and 8.33% female which showed considerable male preponderance. This finding was similar to studies by Davood Mansoori *et al.*, [25] (2000) who found significant predominance of coinfection in male individuals partly due to the higher rate of males infected with HIV vast majority of whom were IV-drug abusers and had previous history of long residence in prison, which facilitated transmission of tuberculosis. In another study by Carvalho *et al*., [26] (2006) among TB-HIV coinfection patients they found considerable predominance of males (48 of the 70 cases), and the greatest number of cases occurred among males from 30 to 50 years of age. On the contrary, Brassard P *et al*., [27] (1999) found 24.8% of coinfection cases were female and the relative risk of TB in females was three times more than males. Similar results (males 4% and females 13%) was found by Murray JF *et al*., [28] (1989) and in another study by Liyan Wang *et al*., [21] (2010) they found among the 12 coinfection cases, 11 were males.

In the present study, the prevalence of HIV positive case (60), Pulmonary TB patients (138) and HIV-TB coinfection cases (10) was found to be highest in the age group 21- 40 years which shows that it was more common in the sexually active age group. This finding was similar to studies by reported by Liyan Wang *et al*., [21] (2010) who found majority in 20 to 49 age group and Davood Mansoori *et al*., [25] (2000) found the majority of coinfected patients were 20 to 40 years old (64.38%), but the relative risk of tuberculosis in this age group did not differ from that of the elder ones (13.4%vs. 12.9%).

The prevalence of risk factors for HIV-TB coinfection in our present study showed that substance abuse was highest (91%) in TB-HIV coinfection group followed by (67%) in HIV positive group and least (58%) in Pulmonary TB group. In our study we included smoking, intake of alcohol or any drug abuse as substance abuse. Among the HIV- TB coinfection group it was found that drug abuse was present in 36% of patients. This finding was similar to study by Bhagyabati D S *et al*., [12] (2005) who found 87% patients including one female were Intravenous Drug Users (IDUs). Mathers BM *et al*., [29] (2008) found that an estimated 20% of the 15 million injection drug users worldwide have HIV infection and account for 10% of the global HIV burden.

In our study it was observed that by occupation truck drivers was a significant risk factor comprising 50% in HIV-TB coinfection group followed 39% in HIV positive group and 0.82% in Pulmonary TB group. In the Pulmonary TB group highest number of patients 48% belong to others which include housewives, shopkeepers, teachers etc. This finding was comparable to the study by Patel *et al*., [30] (2011) who found majority of them were farmers and laborers followed by transport drivers, Ramachandra Kamath *et al*., [31] (2013) observed laborers 42.4%(n= 290), Mohanty *et al*., [32] (1993) reported 36.8% patients working as manual laborers while Rajsekaran *et al*., [20] (2000) found majority (55.6%) of patients working as farmer. Bhagyabati D S *et al*., [12] (2005) found highest among unemployed (40%) followed by business professionals (35%). The percentage of the professions is thus seen to vary in different studies, largely due to the differences in the occupational patterns and

the source from where the patients were selected.

The prevalence of illiteracy was highest 83% in the HIV-TB coinfection group, followed by 78% in the HIV group and least 51% was seen in pulmonary TB group which showed it was one of the risk factors for HIV-TB coinfection. This finding was similar to the study by Ramachandra Kamath *et al*., [31] (2013) who observed that 74.9%(n = 512) of the HIV-TB coinfection patients having less than primary level of education and in another study by Carvalho *et al*., [26] (2006) they found in the 70 coinfected patients, 37 had seven or less years of schooling and 6 were illiterate.

The distribution of married and unmarried person was equal (1:1) in the HIV-TB coinfection group 1.96:1 in HIV group, and 1.29:1 in TB group which did not show any considerable difference in the distribution pattern among the two groups. This finding was similar to the study by Liyan Wang *et al*., [21] 2010 who found 58.3% were married but contrary to study by Davood Mansoori *et al*., [25] (2002) who reported only 6.9% of coinfected patients were married; thus, unmarried HIV-positive patients developed TB 13.6 times as likely as married individuals.

CONCLUSION

To conclude our study entitled, "A study on HIV-TB coinfection among patients attending a Tertiary Care Centre in North East India" was conducted on a limited number of sample size within a period of 1 year. HIV-TB coinfection represents a novel pathogenic scenario at the global level. It constitutes a serious diagnostic and therapeutic challenge particularly in poor countries. In our study, we found that prevalence of HIV-TB coinfection was lower in contrast to many studies where the prevalence was higher. This difference may be due to the fact that we included the total population attending ICTC and DOTS whereas in many of the studies it was restricted to either TB or HIV positive population so higher prevalence was found. In our study, we found that the prevalence of coinfection was more common among males in the sexually active age group. Substance abuse, illiteracy and truck drivers by occupation were found to be risk factors for coinfection in comparison to other similar studies. However, this may not be significant because of the limited sample size.

REFERENCES

1. Pfyffer GE, Vincent V. *Mycobacterium tuberculosis* complex, *Mycobacterium leprae*, and other slow-growing mycobacteria. In: Borriello SP, Murray PR, Funke G.(eds.) Topley and Wilson's Microbiology and Microbial Infections, Bacteriology Vol 2. 10th ed. Hodder Arnold 338 Euston Road, London: ASM Press; 2005. 1181-1235.
2. WHO report. Global tuberculosis Control. October 2011
3. Pande JN. Tuberculosis research in India. Indian J Med Res. 2004 Oct;120(4):205-206.
4. Kumaraswamy N, Solomon S, Flanigan TP, Hemalatha R, Thyagarajan SP, Mayer K H. Natural History of Human Immunodeficiency Virus Disease in Southern India. Clinical Infectious Dis. 2003 January; 36 :79 - 85.
5. Sharma SK, Mohan A. Co-infection of human immunodeficiency virus (HIV) and tuberculosis: Indian perspective. Indian J Tuberc. 2004;51:5.
6. Swaminathan S and Narendran G. HIV and tuberculosis in India. J Biosci.2008;33(4): 527–537.
7. 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.
8. Dermont M, Anthony H, Haileyesus G. Tuberculosis and HIV interaction in sub-saharan Africa: impact on patients and programmes; implication for policies. Trop Med Int Health. 2005;8:734.
9. Global tuberculosis control: Epidemiology, strategy, financing. WHO/HTM/TB/2009. 411.
10. [Internet]Available from http://www.who.Int/tb/publications/ TBHIV_Facts _for_2011.Pdf
11. Narain JP, Lo YR, Epidemiology of HIV-TB in Asia. Indian J Med Res.2004;120:277-89.

12. 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.
13. Ragini Ghiya,Eknath Naik,Beata Casanas, Ricardo Izurieta, Yogesh Marfatia Clinico-epidemiological profile of HIV/TB coinfection patients in Vadodara, Gujarat. Indian J Sex Transm Dis & AIDS. 2009;30(1): 10-5.
14. Anand K. Patel, Sandip J. Thakrar, Feroz D. Ghanchi. Clinical and laboratory profile of patients with TB/HIV coinfection: A case series of 50 patients. Lung India. Apr - Jun 2011; 28(2).
15. Guidelines for HIV testing. National AIDS Control Organisation.2007, March.
16. Central TB Division & National AIDS Control Organization, New Delhi, March 2010.
17. Managing the Revised National Tuberculosis Control Programme in your area, Central TB Division, Directorate Gen. Health Services, Ministry of Health and Family Welfare, New Delhi, 1999.
18. Sharma SK, Saha PK, Dixit Y, Siddaramaiah NH, Seth P, Pande JN. HIV seropositivity among adult tuberculosis patients in Delhi. Indian J Chest Dis Allied Sci.2000; 42:157-60.
19. Banavaliker JN, Gupta R, Sharma DC, Goel MK, Kumari S. HIV seropositivity in hospitalised pulmonary tuberculosis patients in Delhi. Indian J Tuberc. 1997;44:17-20.
20. Rajasekaran R, Lima A, Kamakshi S, Jeyaganesh D, Senthamizhchelvan A, Savithrr S, *et al.* Trend of HIV infection in patients with tuberculosis in rural south India. Indian J Tuberc. 2000;47: 223.
21. Wang L, Liu W. HIV prevalence among pulmonary TB patients in Gvangxi China. J Acquir Immune Defic Syndr. 2010 February; 53(Suppl 1): S61.
22. Mohanty KC, Basheer PMM. Changing trend of HIV infection and tuberculosis in a Bombay area since 1988. Indian J Tuberc. 1995; 42:117-20.
23. Samuel NM, Alamelu C, Jagannath K, Rajan B. Detection of HIV infection in pulmonary tuberculosis patients. J Indian Med Assoc. 1996; 94 :331-3.
24. Paranjape RS, Tripathy SP, Menon PA, Mehendale SM, Khatavkar P, Joshi DR,*et al*. Increasing trend of HIV seroprevalence among pulmonary tuberculosis patients in Pune, India. Indian J Med Res. 1997; 106:207-11.
25. Davood Mansoori, Kamyar Alaei, Arash Alaei Prevalence of Clinical Tuberculosis in HIV Infected Patients from Kermanshah Province, IRAN Tanaffos. 2002 ;1(2): 27-33.
26. Luiz Gustavo Miranda de Carvalho, Anabelli Zanchetta Buani, Maria Stella Amorim da Costa Zöllner, Alexandre Prado Scherma. Co-infection with Mycobacterium tuberculosis and human immunodeficiency virus: an epidemiological analysis in the city of Taubaté, Brazil. J Bras Pneumol.2006;32(5):424-9.
27. Brassard P, Remis RS. Incidence of TB among reported AIDS cases in Quebec from 1979 to 1996. Canadian Medical Association J. 1999; 160(13):1838-42.
28. Murray JF. The white plague: down and out, or up and coming. Am Rev Respir Dis. 1989; 140(6):1788-95.
29. Mathers BM, Degenhardt L, Phillips B, et al. Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review.Lancet. 2008; 372: 1733-1745.
30. Anand K. Patel, Sandip J. Thakrar, Feroz D. Ghanchi. Clinical and laboratory profile of patients with TB/HIV coinfection: A case series of 50 patients. Lung India. Apr - Jun 2011; 28(2).
31. Ramachandra Kamath, Vikram Sharma, Sanjay Pattanshetty, Mohandas B.Hegde1, Varalakshmi Chandrasekaran HIV-TB coinfection: Clinico epidemiological determinants at an antiretroviral therapy center in Southern India. Lung India. Oct - Dec 2013;30(4) .
32. Mohanty KC, Sundrani RM, Nair S. HIV infection in patients with respiratory disease. Indian J Tuberc. 1993;40: 5.

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