A CLINICAL STUDY ON HIV/AIDS WITH SPECIAL REFERENCE TO ITS PULMONARY MANIFESTATIONS IN A TERTIARY CARE HOSPITAL OF NORTH-EAST INDIA

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Abstract
Objective
To study the clinical presentation, pattern of opportunistic infections and the pattern of pulmonary disease in HIV/AIDS patients in a tertiary care Hospital of north-east India.
Methods
This is a hospital-based observational study among 205 selected adult patients with HIV/AIDS(as per NACO guidelines) attending the Gauhati Medical College Hospital from1st July, 2018 to 30th June, 2019. A detailed clinical history of the selected cases were recorded in standard Performa including demographic profile, transmission dynamics and clinical profile including CD4 count.
Results
The age of the study population ranged from 15 to 68 years. The maximum number of patients were in the age group of 21 to 30 years (68 cases, 33.17%). Majority of the patients were male (61.46%). Majority of the patients were married (67.80%)and literate (94.15%). The most common affected group was housewives (26.81%) followed by security personnel (14.51%), businessmen (12.68%), students (11.71%), and drivers (4.49%). The most common route of transmission was heterosexual (77.56%), followed by MSM (12.19%), intravenous drug users (2.44%) and unknown route (3.41%). Fever was the most common presenting symptom (40.49%), followed by diarrhoea (30.24%), weight loss (29.76%), cough (16.10%), pain abdomen (5.76%), skin problem (6.83%), dysphagia(4.88%), dyspnoea (3.5%), oral ulcers(4.88%), neck swelling (3.90%), palpitation(3.90%), chest pain (2.65%), hemoptysis (2.93%), malaise(2.93%), anorexia (2.93%) and genital ulcer (2.44%).Opportunistic infection was found in 112 patients (54.63%). Tuberculosis was the commonest OI, being diagnosed in 44 patients (39.29%), followed by Candidiasis (28 cases, 24.78%), Chronic diarrhoea (26 cases,

23%), bacterial pneumonia (13 cases, 11.5%), Herpes zoster (8 cases, 7.07%), Pneumocystic carinii pneumonia (3 cases, 2.65%), Cryptococcal Pneumonia (3 cases, 2.65%), Penicillium marneffi infection (2 cases, 1.65%) and Molluscum contagiosum (1case, 0.89%).The median CD4 count in patients with OI was 194/cumm and those without OI was 638/cumm, which is statistically significant with P value of 0.0185. Pulmonary manifestations were present in 20.98% cases. Out of all pulmonary manifestations, Pulmonary Tuberculosis (60.47%) was the commonest, followed by bacterial pneumonia (30.23%), PCP (6.98%) and ILD(2.33%).

Conclusions

In the present study, HIV was mainly observed in the economically productive young males and females. Housewives were the most affected group followed by service holders (security personnel) with heterosexual transmission being the most common route. Fever was the most common presenting symptom followed by diarrhoea, weight loss, cough. Tuberculosis was the most common opportunistic infection followed by candidiasis, chronic diarrhoea and respiratory tract infection. There is a statistically significant inverse relationship between opportunistic infection and CD4 count. Similarly, Extra-Pulmonary Tuberculosis was more with low CD4 count compared to Pulmonary Tuberculosis, which is statistically significant. Pulmonary tuberculosis was the most common pulmonary manifestation followed by lower respiratory tract infection, PCP pneumonia and interstitial lung disease.

Key Words: Clinical HIV/AIDS Pulmonary Manifestations.

INTRODUCTION

HIV infection is a global pandemic with cases reported from virtually every country. The HIV epidemic has occurred in waves in different regions of the world, each wave having somewhat different characteristics depending on the demographics of the country and region in question and the timing of the introduction of HIV into the population. According to Joint UN Programme on HIV/AIDS (UNAIDS), at the end of 2016, an estimated 36 million individuals were living with HIV infection. In 2016, global prevalence rates showed that the worst hit areas were the Sub Saharan Africa and the Asia and Pacific region. [1]

The national adult HIV prevalence in India is 0.26%, while the prevalence in Assam is 0.07%.(*NACO, 2017*). [2]

HIV is transmitted primarily by sexual contact, by blood and blood products and by infected mothers to infants intrapartum, perinatally or via breastmilk. The clinical consequences of HIV infection encompass a spectrum ranging from an acute clinical syndrome associated with primary infection to a prolonged asymptomatic stage to advanced disease. The spectrum of illnesses changes as the CD4+ T cell count declines. [1]

Infections associated with severe immunodeficiency are known as opportunistic infections (OIs) because they take advantage of a weakened immune system. Some of these opportunistic infections are used to mark the stages of HIV/AIDS. Before the widespread use of potent combination antiretroviral therapy (ART), Opportunistic Infections were the principal cause of morbidity and mortality in HIV-infected patients worldwide. In one study, the mortality rate among individuals with a history of preventable Opportunistic Infections was 66.7 per 100 people per year compared with 2.3 per 100 people per year for those without a history of preventable Opportunistic Infections. [3]

Respiratory symptoms are a frequent complaint among HIV-infected individuals and may be caused by a wide spectrum of illnesses. The spectrum of pulmonary illnesses in HIV-infected patients includes both HIV-related and non-HIVrelated conditions. The HIV-associated pulmonary conditions include both opportunistic infections (OIs) and non-infectious diseases. The OIs involve bacterial, mycobacterial, fungal, viral, and parasitic pathogens. Each of these OIs and neoplasms has a

characteristic clinical and radiographic presentation. The most common pulmonary manifestation among HIV-infected individuals is Tuberculosis, followed by bacterial pneumonia. The incidence of Pneumocystis carinii pneumonia was high during initial days of HIV pandemic. However, after the introduction of ART and effective prophylactic regimen, its incidence has declined dramatically. The rates of OIs affecting respiratory system are significantly greater in cohort members with entry CD4 counts < 250. Disease stage and demographic and exposure factors are important variables affecting the respiratory manifestations of HIV infection. Among the non-infectious pulmonary manifestations, interstitial lung disease, primary pulmonary artery hypertension, chronic obstructive airway disease and neoplasms such as Kaposi's sarcoma are reported in HIV-infected patients. [1]

AIM AND OBJECTIVES
Although a number of studies have been done worldwide as well as in India, there is a dearth of such study in this part of the country. Therefore, this study was taken up to study the clinical presentation, pattern of opportunistic infections and the pattern of pulmonary disease in HIV/AIDS patients in a tertiary care Hospital of north-east India.

MATERIALS AND METHODS
This study was carried out in Gauhati Medical College and Hospital from 1st July, 2018 to 30th June, 2019.

Sample size
205

Calculation of sample size
Z^2*(p)*(1-p)/d^2
(Wayne W. Daniel) Where:
Z= Z value (e.g. 1.96 for 95% confidence level)
P= prevalence of HIV/AIDS in India, expressed as a decimal
Here taken as 0.26% (NACO 2017)[2]
D= precision, here taken as 0.06%.

Study type
Hospital Based observational study.

Study location
Gauhati Medical College and Hospital.

Source of data
ART PLUS Centre, Department of Medicine and Department of Pulmonary Medicine (both indoor and outdoor patients)

Ethical clearance
Obtained from the Institutional Ethics Committee.

Duration of study
1st July, 2018 to 30th June, 2019

Inclusion criteria
• HIV infected patients.
• Above 15 years of age. (as per NACO guidelines).
• All ART naive patients were included.

Exclusion criteria
- All HIV positive children below 15 years (as per NACO guidelines) [1]
- Patients on Anti Retroviral Therapy

Data collection
- Interviewing the patients/ attendants.
- Thorough clinical examination.
- Relevant investigations as per NACO guidelines[2] and other relevant investigations.
- Data is recorded in preformed and pretested proforma.

Diagnosis of cases
Diagnosis of cases was done as per NACO Guidelines after written consent with pre and post test counselling. All investigations were done as per NACO guidelines and other relevant investigations. HIV test was done according to NACO guidelines.

Diagnostic Algorithm
To diagnose HIV, 3 tests are required. Assays A1, A2, A3 represent 3 different assays based on different principles or different antigenic compositions. Assay A1 is of high sensitivity and A2 and A3 are of high specificity. A2 & A3 able to differentiate between HIV 1 & 2 infection.
(NACO operational guideline, 2018) [4]

CD4 COUNT MEASUREMENT:
Immunoflurescence analysis by flow cytometry using FACS Calibur Flow Cytometer was used for CD4 T lymphocyte measurements. FACS Count system is the product of Becton Dickinson Biosciences.

Statistical analysis:
Data was collected, coded and fed in MS exce l07 and GRAPHPAD INSTAT software for statistical analysis. Descriptive statistics analysis was carried out including frequency and percentage. The results of the study were tabulated.

RESULTS
1) Clinical profile
demographic profile
Age distribution
The maximum number of patients were in the age group of 21-30 years (68 patients, 33.17%) followed by 31-40 years (54 patients, 26.34%). The median age was 34. Standard deviation is 12.17. Most of the patients belonged to the younger age group.

Sex distribution
126 (61.46%) of patients were males and 79 (38.54%) were females. Male female ratio is 1.59:1.

Marital status
Out of 205 patients, 139(67.8%) were married, 50 (24.39%) were unmarried and 16 (7.8%) were widow and widower.

Education
Majority of the cases were literate out of which 55 cases (26.83%) attended college, 107 cases (52.19%) attended secondary schools and 31 cases (15.12%) attended primary schools. Illiterate consisted of 12 cases (5.85%).

Education	No of cases	Percentage (%)
COLLEGE	55	26.83
SECONDARY	107	52.19
PRIMARY	31	15.12
ILLITERATE	12	5.85
Table 1: Education		

Occupation

The most common affected group was housewives (55 cases, 26.81%), followed by service holders (security personnel) (29 cases, 14.51%), businessmen (26 cases, 12.68%), student (24 cases, 11.71%), hotel staff (16 cases, 7.8%), non-agricultural labourer (16 cases, 7.80%), skilled worker (11 cases, 5.37%), unemployed (10 cases, 4.88%), agricultural labourer (8 cases, 3.91%), local transport worker (7 cases, 3.41%) and truck driver (3 cases, 1.48%).

Occupation	No of cases	Percentage (%)
AGRICULTURAL LABOURER	8	3.91
NON AGRICULTURAL LABOURER	16	7.80
SKILLED WORKER	11	5.37
BUSINESS/SMALL SHOP/SELF EMPLOYED	26	12.68
SERVICE	29	14.15
STUDENT	24	11.71
TRUCK DRIVER	3	1.48
LOCAL TRANSPORT WORKER	7	3.41
HOTEL STAFF	16	7.80
UNEMPLOYED	10	4.88
HOUSEWIFE	55	26.81
Table 2: Occupation		

Routes of Transmission

Most common route of transmission was heterosexual (159 cases, 77.56%), followed by MSM (25 cases, 12.19%), followed by unknown route (7 cases, 3.41%), followed by IDU (5 cases, 2.44%).

Routes of transmission	No of cases	Percentage (%)
HETEROSEXUAL	159	77.56
MSM	25	12.19
UNKNOWN	7	3.41
IDU	5	2.44
Table 3: Routes Of Transmission		

Clinical Presentation

Most common presenting feature is fever (80 cases, 39.02%) followed by asymptomatic in 75 cases (36.59%), diarrhoea in 60 cases (29.26%), weight loss in 61 cases (29.76%), cough in 33 cases (16.10%), pain abdomen in 12 cases (5.85%), skin problem in 14 cases (6.83%), dyspnoea in 7 cases(3.5%), dysphagia in 10 cases (4.88%), oral ulcers in 10 cases (4.88%), neck swelling in 8 cases (3.90%), palpitation in 8 cases (3.90%), chest pain in 5 cases (2.44%), hemoptysis in 6 cases (2.93%), malaise in 6 cases (2.93%), anorexia in 6 cases (2.93%) and genital ulcer in 5 cases (2.44%).

Presenting feature	No of cases	Percentage (%)
FEVER	80	39.02
DIARRHOEA	60	29.26
WEIGHT LOSS	61	29.76
COUGH	33	16.10

ANOREXIA	6	2.93
CHEST PAIN	5	3.41
DYSPNOEA	7	3.5
DYSPHAGIA	10	4.88
GENITAL ULCER	5	2.44
HEMOPTYSIS	6	2.93
MALAISE	6	2.93
NECK SWELLING	8	3.90
ORAL ULCERS	10	4.88
PAIN ABDOMEN	12	5.76
PALPITATION	8	3.90
SKIN PROBLEM	14	6.83
ASYMPTOMATIC	75	36.59
Table 4: Clinical Presentation		

2) Spectrum of opportunistic infections
Incidence of opportunistic infections
Out of 205 patients, opportunistic infections were present in 112 patients (54.63%). Of 112 patients, 31 (27.68%) had multiple opportunistic infections. Most common was tuberculosis(44 cases, 39.29%). Pulmonary tuberculosis was found in 26 cases (59.09%), extra pulmonary tuberculosis was present in 18 cases (40.91%) .Candidiasis (both oral and oesophageal) was present in 28 cases (24.78%), followed by diarrhoea in 26 cases (23%), bacterial pneumonia in 13 cases (11.5%), herpes zoster infection in 8 cases (7.07%), Pneumocystis carinii pneumonia in 3 cases (2.65%), Penicillium marneffi infection in 2 patients (1.65%), Cryptococcal meningitis in 3 cases (2.65) and Molluscum contagiosum in 1 case (0.89%).

OPPORTUNISTIC INFECTIONS	NO OF CASES	PERCENTAGE (%)
TUBERCULOSIS	44	39.29
CANDIDIASIS	28	24.78
BACTERIAL PNEUMONIA	13	11.5
DIARRHOEA	26	23
P. CARINII PNEUMONIA	3	2.65
M. CONTAGIOSUM	1	0.88
P. MARNEFII	2	1.65
H. ZOSTER	8	7.08
CRYPTOCOCCAL MENINGITIS	3	2.65
Table 5: Opportunistic Infections		

Opportunistic Infection In Relation To CD4 Count
The total no of patients with OI was 112 and without OI was 93 .The median CD4 count in those with OI was 194 cells/mm3 while in those without OI was 638 cells/mm3. The P value is 0.0185, which is statistically significant. Tuberculosis was the most common OI in patients with low CD4 count.

Tuberculosis In Relation to CD4 Count
The total number of cases with tuberculosis was 44, out of which 26 cases (59.09%) were pulmonary tuberculosis and 18 cases (40.91%) were extra pulmonary tuberculosis. Out of 26 cases of PTB, 9 cases (35%) had CD4 count <200cells/cumm and 17 cases (65%) had CD4 count >200 cells/cumm. Out of 18 cases of EPTB, 13 cases (73.33%) had CD4 count <200 cell/cumm and 5 cases (26.67%) had CD4 count >200 cells/cumm. The P value is 0.0276 which is considered significant. Relative risk is 0.5085 and 95% CI is 0.2691 to 0.9611.

CD4 COUNT	PTB	EPTB
<200 CELLS/CUMM	9	13
>200 CELLS/CUMM	17	5
Table 6: Tuberculosis in Relation to CD4 Count		

3. Pulmonary Manifestations
Spectrum of pulmonary manifestations
In the present study, pulmonary manifestations were found in 43 patients (20.98%). The most common pulmonary manifestation was pulmonary tuberculosis found in 26 cases (60.47%). This was followed by bacterial pneumonia (13 cases, 30.23%) Pneumocystis carinii pneumonia was found in 3 cases(1.4% of study population) Among the non-infectious pulmonary manifestations, interstitial lung disease was found in 1 case(0.5%).

Pulmonary manifestation	No of cases	percentage of cases
Pulmonary Tuberculosis	26	60.47%
Bacterial Pneumonia	13	30.23%
Pneumocystis carinii pneumonia	3	6.98%
Interstitial Lung Disease	1	2.33%
Table 7 : Spectrum of pulmonary manifestations		

Sputum smear status of pulmonary tuberculosis
Among the 26 cases of pulmonary tuberculosis, 12 cases(46%) were found to be sputum smear positive for AFB and 14 cases(54%) were negative

Sputum	No. of cases	Percentage
Positive	12	46%
Negative	14	54%
Table 8 : Sputum smear status of pulmonary tuberculosis		

DISCUSSION
Age distribution
In the present study, the maximum number of patients were found to be in the age group of 21-30 years (68 patients, 33.17%), 54 patients (26.34%) are found to be in the age group of 31 to 40 years. Thus, 59.51 % of the total study population was in the reproductive age group of 21 to 40 years, the median age being 34 years which is similar to the study conducted by *Inverarity et al,2000*[5] where the highest prevalence of HIV occurred in the median age of 31 years.[6]

The decreasing trend in the younger age group over the years may be due to increasing awareness among the younger generation and the changing scenario among elderly about non disclosure associated with various social and religious taboo. In the present study, 14.14% of cases were in the age group >50 years of age which is consistent with studies by CDC 2005[7] and NACO 2010-11[8] which reported 11-15%, 15% and 13.2% cases >50 years of age respectively.[7,8]

Sex distribution
In the present study, 126 (61.46%) of patients were males and 79 (38.54%) were females. Male female ratio is 1.59:1. Males were affected more than the females across all age groups. These findings are similar to study by *Invarity D et al,2000* [5] which reported 64.3% and 70% males in their study population respectively.The increasing trend of prevalence among females in the recent studies may be due to increasing awareness among females regarding voluntary testing of HIV and as a part of couple counselling and testing and increase in the number of females attending the HIV clinics and regular voluntary testing in antenatal clinics.

Marital status

In the present study, 139 (67.80%) patients were found to be married, 50 (24.39%) were unmarried and 16 (7.8%) were widow or widower. Similar observations were made by *Inverarity D et al,2000* [5] and they found 69% of patients to be married. The slightly higher number of married individuals may be due to larger sample size of the study population involved in that study.

Education

In this study, majority of the cases were literate. Out of which 55 cases (26.83%) attended college, 107 cases (52.19%) attended secondary schools and 31 cases (15.12%) attended primary schools. 12 cases were illiterate (5.85%). These findings are consistent with the study conducted by *Kumar a et al, 2008*[6] where 57.2% cases were literate. Contrast to these studies, *Inverarity D et al, 2000*[5] found that 97% of the study population were literate, which is probably because general high literacy rate among western population.

Occupation

The most commonly affected group in the present study was housewives (55 cases, 26.81%). This finding is similar to the studies conducted by *Kumar A et al (2008)*[6] and *Darbastwar M et al (2011)*[9] who reported prevalence of HIV in housewives to be 34.2% and 49.2% respectively. The high prevalence of HIV among housewives is probably due to the high risk behavior of their spouses.

Service holders (security personnel) were the second most affected group (29 cases, 14.51 %) in the present study which is similar to the study of *Mukhopadhyay C et al (2001)*[10] who reported highest incidence of HIV in security personnel.

Businessmen (26 cases, 12.68%) and truckers and local drivers (10 cases, 4.49%) follows next in the present study which is similar to the findings in the study by Sharma SK et al.,2004[11] which reported businessmen and drivers to be 17.9% and 10.4% respectively. The lower incidence among truckers in the present study might be because of the higher sample size and also due to lack of awareness about HIV among the lesser educated strata of our society thus leading to low reporting of cases to the tertiary care centres.

Routes of transmission

The most common route of transmission was heterosexual (159 cases, 77.56%) in the present study. This finding is consistent with studies conducted by *Kothari K et al,2001*[12] *Nair SP,2003*[13], *Kumarasamy N et al,2003*[13] who reported heterosexual route as the most common mode of transmission in 70%, 71.1% and 93% cases respectively.

The present study found MSM route in 25 (12.19%) cases. This is slightly higher than rates reported in earlier Indian studies of *Nair SP et al (2003)* [13] *and Darbastwar M et al (2011)*[9], who reported MSM in 1.65% and 1.2% respectively. *Sharma SK et al (2004)*[11] did not find any MSM cases. The increase in MSM cases in the present study could be due to the fact that more MSM persons are openly expressing their sexual orientation due to increased awareness following greater social and legal acceptibility than before.

Intravenous drug use was found in 5 cases (2.44 %) in the present study. This is similar to the study of *Sharma SK et al (2004)*[11] who reported incidence of IDU in 3.7% cases. However, studies conducted in Manipur of North-East India reported IDU as the most common risk factor which was commonly seen in young males sharing needles. The high incidence of IDU as a risk factor in Manipur is probably due to the high number of intravenous drug users and easy accessibility of the same in Manipur.

7 patients (3.41 %) had unknown mode of transmission. *Sharma SK et al (2004)*[11] in their study reported that 10% patients had unknown route of transmission. Similar observation was also made by *Chakravarty J et al (2006)*[6] who reported that history suggestive of a risk factor for HIV transmission could not be elicited in 14.1% patients. It is likely that these patients were reluctant to reveal, due to prevailing social norms, which discourage polygamy and homosexuality. Awareness among masses

has resulted in behavioral modifications and has led them to reveal their sexual orientation and routes of exposure to HIV.

Clinical presentation

As with the present study, where fever was the commonest symptom(40.49%), *Kothari K (2001)*[12] also found fever as the commonest symptom in 90% cases. The findings also corroborates with the study of *Chakravarty J et al,(2006)*[14] who reported fever as the most common presenting complain(55%).

Diarrhoea was the second most common clinical presentation with 30.24% patients presenting with the same. *Chakravarty J et al,(2006)*[14]found chronic diarrhoea in 43.9% cases. Compared to older studies, newer studies show decrease in the percentage of diarrhoea as presenting feature. This is probably due to early diagnosis and early initiation of ART.

Weight loss was the third most common clinical presentation with 29.76% cases presenting with significant weight loss. *Chakravarty J et al,(2006)*[14]also found weight loss as the third most common clinical presentation with 53.3% of their cases presenting with significant weight loss.

Cough was present in 16.10% cases in the present study. *Chakravarty J et al,(2006)*[14] reported cough in 21% of their cases.

Clinical presentations such as skin manifestation(6.83%), oral ulcer(4.88%), genital ulcer(2.44%) are reported much lower than previous studies such as *Chakravarty J et al,(2006)*[14] who reported skin manifestations, oral ulcer and genital ulcer in 7.6%, 10.8% and 2.9% cases respectively. This may be due to the fact that these manifestations are mostly results of Opportunistic infections and with early diagnosis and initiation of effective prophylaxis the incidence and the pattern of OIs have changed and hence clinical manifestations.

75 patients (36.59%) were asymptomatic, of which 15 (20%) patients were pregnant and diagnosed during routine antenatal checkup. Following their diagnosis, the spouses of these women were screened for HIV and thereby found positive. The rest 45 asymptomatic patients were detected during voluntary testing. This is similar to the study of *Cao W et al (2014)*[15] who found 26.26% cases to be asymptomatic. In contrast, *Tripathy S et al (2014)*[16] reported 56.5% asymptomatic cases in their study with a sample of 1546 subjects. This difference is probably due to higher sample size in their study.

Spectrum of opportunistic infections
incidence of opportunistic infections

Several studies also confirm the high prevalence of TB in HIV infected individuals in India. These studies conducted by *Vajpayee M et al (2003)*[17], *Sharma SK et al (2004)*[11] *and Ghate M et al, 2009*[18] reported TB as the commonest OI in 47%, 71% and 15.4% of their cases respectively. Of all cases of tuberculosis in the present study, 59.09% cases were pulmonary tuberculosis and 40.91% cases were extra-pulmonary tuberculosis. *Vajpayee et al, 2003* also found similar results with predominant form TB being EPTB(61%). The predominance of pulmonary tuberculosis in newer studies in contrast to older studies indicates change in the natural history of the disease and may be due to early diagnosis and initiation of ART.

In the present study, Candidiasis was found in 28 cases (24.78%).This is similar to study done by *Vajpayee M et al in 2003*[17] who reported candidiasis in 25.2%. However, *Kumaraswamy et al(2003)*[19], *Sharma SK et al(2004)*[11] *and Ghate M et al in 2009*[18] reported candidiasis in 40%, 39.3% and 11.3% cases respectively. Higher number of candidiasis is probably due to the fact that HAART was not available widely during that period.

The incidence of chronic diarrhoea in this study is 23% (26 cases). Though stool examination was done in all cases of chronic diarrhoea, no organism could be identified in any case. This may be partly due to the fact that most of the patients had received empirical therapy with metronidazole and other antibiotics or were on co-trimoxazole prophylaxis. However, other Indian studies conducted by

Vajpayee M et al (2003)[17] found chronic diarrhoea in 43.5%. At YRG CARE, Chennai, Cryptosporidium parvum was present in 70% of stools of those with diarrhoea (mean CD4 count 213/cumm) and 66% of those without diarrhoea (mean CD4 count of 406/cumm) (*Kumarasamy N et al, 2003*)[19]. The higher incidence of chronic diarrhoea may be explained by the fact that ART was not available widely during the early period of HIV pandemic.

In the present study, bacterial respiratory tract infection was found in 13 cases(11.53%) which correlates well with the recent studies that have observed high rates of bacterial pneumonia of 7.7 and 9.1 cases per 100 person-years.(*Tumbarello M et al.,1999*[20] *and Sullivan JH et al.,2000*)[21]. In Europe, the proportion of cases of AIDS associated with recurrent bacterial pneumonia increased 3-fold (from 1.5% to 4.6%) (*Boumis E et al,2001*).[22] In a cohort of male injection drug users in Puerto Rico, the proportion of persons with bacterial pneumonia increased from 28.7% in 1992 to 35.7% in 2000 (*Amill A et al., 2004*).[23] This is due to the increase in IDU in recent years.

The present study found 8 (7.08%) cases of Herpes zoster infection which coincides well with the studies by *Kumarasamy N et al.,2003*[19], who found Herpes Zoster infection in 8% and *Ghate M et al in 2009* who found herpes zoster in 10.1% cases (95% CI 7.6-13.1).

In the present study, 3 patients (2.65 %) had *Pneumocystis jiroveci* pneumonia (PCP). This observation is similar to other Indian studies conducted by *Kumarasamy N et al (2003)*[19], *Vajpayee M et al (2003)*[17] *and Rupali et al (2003)*[24] who reported PCP in 4%, 7.4% and 7% cases respectively, which shows a decline in the incidence of PCP over the years. This could be because of the early detection of HIV, increased awareness and early initiation of cotrimoxazole prophylaxis.

In the present study, 2 patients (1.65%) had Penicillium marneffei infection. In the study conducted by *Ranjana K H et al,2002*[25] at Manipur percentage of cases with disseminated P. marneffei was 25%. This high prevalence is because the organism is endemic to that area.
Awareness, early diagnosis, nutritional counselling, prophylaxis for OI and early initiation of ART are the major factors leading to changing patterns of OI.

Opportunistic Infections in Relation to CD4 Count
In the present study, CD4 count in patients with OI ranged from 19 to 1234. The median CD4 count in patients with OI was 194/cumm and those without OI was 638/cumm, which is statistically significant with P value of 0.0185. This is similar to the observation made by *Ghate M et al (2009)*[18] who reported that patients with baseline CD4 counts of <200/cumm were six times more likely to develop OIs compared to those with CD4 counts >350/cumm.
81 patients (71.68 %) with OI had CD4 count less than 200/cumm corroborating the fact that as the CD4 count decreases, the incidence and spectrum of OIs increases among the patients. Tuberculosis, PCP, chronic diarrhoea, and Candidiasis were most often found in patients with CD4 count less than 200/cumm.

Tuberculosis in Relation to CD4 Count
Out of 24 cases of PTB in the present study, 9 cases (35%) had CD4 count <200cells/cumm and 17 cases (65%) had CD4 count >200 cells/cumm. Out of 18 cases of EPTB, 13 cases (73.33%) had CD4 count <200 cell/cumm and 5 cases (26.67%) had CD4 count >200 cells/cumm, which is statistically significant, P= 0.0276. Tuberculosis is more frequent at CD4 counts <300 cell/cumm. Extra-pulmonary tubercular manifestations occur in 46 to 79% of patients with TB and HIV *(Kumar P et al, 2002)*[26] and is more frequent in severely immunocompromised patients (*Vajpayee et al, 2003*)[17]. According to a study conducted by *Mishra S et al,2015*[27], TB was most common when CD4 cell count was less than 200/ml which coincides with the findings of this study.

Spectrum of pulmonary manifestations
incidence of pulmonary manifestations

In the present study, pulmonary manifestations were found in 43 patients (20.98%). The most common pulmonary manifestation was pulmonary tuberculosis found in 26 cases (60.47%). Of all cases of tuberculosis, 59.09% cases were pulmonary tuberculosis Several studies conducted also confirm the high prevalence of TB in HIV infected individuals in India. *Manjareeka M et al, 2013*[28] found the prevalence of pulmonary tuberculosis among HIV-infected people as 12.3%, as compared to the present study which found prevalence of pulmonary tuberculosis among the study population as 12.68%. The slightly higher number may be due better diagnostic modalities available than before in diagnosis of Tuberculosis, including CB-NAAT.

This was followed by bacterial pneumonia(13 cases, 30.23%), with an incidence of 11.5%, which correlates well with the recent studies that have observed high rates of bacterial pneumonia of 7.7 and 9.1 cases per 100 person-years. (*Tumbarello M et al.,1999*[20] *and Sullivan JH et al.,2000*)[21]. However, in a prospective study conducted by *Salami AK et al in 2006*[29] over a period of 16 months, 22.6% patients with HIV developed community acquired pneumonia. This could due to the fact that the mentioned study was a prospective one and followed up patients for a long duration. Out of 13 cases of respiratory tract infection, in only 2 cases sputum culture showed growth of organisms (both Klebsiella pneumoniae). This could be due to initiation of empirical antibiotic therapy before collection of samples.

Pneumocystis carinii pneumonia was found in 3 cases(1.4% of study population) which is similar to Indian studies conducted by *Kumarasamy N et al (2003)*[19], *Vajpayee M et al (2003)*[17] *and Rupali et al (2003)*[24] who reported PCP in 4%, 7.4% and 7% cases respectively. There has been a sharp decline in PCP cases all across the globe due to early detection of HIV and subsequent introduction ART and prophylaxis against Pneumocystis carini. In the United States, the incidence of PCP decreased 3.4% per year during 1992 to 1995 and declined 21.5% per year from 1996 to 1998. All the 3 cases of PCP in the present study had CD4 count less than 200/cumm, with mean CD4 count of 138/cumm, which is consistent with the studies conducted by *Kumarasamy N et al, 2003* [19] and *Vajpayee et al, 2003* where the median CD4 count among PCP cases were 142/cumm and 87/cumm respectively.

Among the non-infectious pulmonary manifestations, interstitial lung disease was found in 1 case(0.5%).

Sputum Smear Status of Pulmonary Tuberculosis

Among the 26 cases of pulmonary tuberculosis, 12 cases(46%) were found to be sputum smear positive for AFB and 14 cases(54%) were negative. *Kumar P et al, 2002*[26] and *Vajpayee et al, 2003*[17] found 34.3% and 36.2% cases of tuberculosis to be sputum smear positive. However, newer studies such as *Mishra S et al,2015*[27] got only 16.8% sputum smear positive cases. The higher percentage of sputum smear positive cases in the present study may be because of the fact the entry point of most of the pulmonary tuberculosis cases were RNTCP and they were tested for HIV after the diagnosis of tuberculosis.

CONCLUSION

In the present study, HIV was mainly observed in the economically productive young males and females. Housewives were the most affected group followed by service holders (security personnel) with heterosexual transmission being the most common route. Fever was the most common presenting symptom followed by diarrhoea, weight loss, cough. Tuberculosis was the most common opportunistic infection followed by candidiasis, chronic diarrhoea and respiratory tract infection. There is a statistically significant inverse relationship between opportunistic infection and CD4 count. Similarly, Extra-Pulmonary Tuberculosis was more with low CD4 count compared to Pulmonary Tuberculosis, which is statistically significant. Pulmonary tuberculosis was the most common

pulmonary manifestation followed by lower respiratory tract infection, PCP pneumonia and interstitial lung disease.

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