

Research Article

Prevalence of Pulmonary Tuberculosis in HIV/AIDS Subjects

Ali A¹, Ahmad F², Imran M^{2*}, Atif M¹, Noor Y¹, Imran S¹, Fatima Z³ and Waqar AB²

¹Department of Pathology, Allama Iqbal Medical College, Pakistan

²Department of Medical Laboratory Sciences (DMLS), Faculty of Health and Allied Sciences (FHAS), Imperial College of Business Studies (ICBS), Pakistan

³Department of Radiological Sciences and Medical Imaging (DRSMI), FHAS, ICBS, Pakistan

*Corresponding author: Muhammad Imran, Department of Medical Laboratory Sciences (DMLS), Imperial Post Graduate Medical Institute (IPGMI), FHAS, ICBS, 25B Lower Mall, Lahore, Pakistan

Received: August 19, 2016; Accepted: October 13, 2016; Published: October 17, 2016

Abstract

Pulmonary Tuberculosis (PTB) is a one of the most serious opportunistic infection in HIV/AIDS subjects and is major cause of mortality and morbidity across the globe especially in developing countries. To find out the prevalence of PTB -HIV/AIDS co-infection in Punjab province of Pakistan, we conducted this cross sectional study at Pathology department of Allama Iqbal Medical College, Lahore. A well-structured questionnaire was designed to determine the socio-demographic and clinical features of the study participants. 150 HIV/AIDS subjects were recruited in this study. For the diagnosis of PTB in HIV infected subjects, we considered clinical history of all the patients and performed sputum examination by microscopy. For further confirmation of PTB, we also performed sputum culture on L-J medium and chest X-ray. CD4+ T lymphocytes count was also determined to assess immunological status of all studied subjects. Out of total 150 subjects, 23 (15.3%) individuals have PTB. The results of the current study disclosed that prevalence of PTB among HIV/AIDS subjects was high. CD4+ T lymphocytes count of co-infected subjects was lower (39.13%) as compared to mono-infected HIV subjects (25.98%) which specifies low immunity in co-infected subjects. HIV/TB co-infection was more prevalent among male (2.66%) than female (12.67%) subjects ($p=0.94$).

Keywords: HIV; TB; Transmission; Infection; Immune; Cells

Introduction

Pulmonary Tuberculosis (PTB) is a one of the most serious opportunistic infection in HIV/AIDS subjects and is major cause of mortality and morbidity in HIV/AIDS subjects worldwide [1]. According to World Health Organization (WHO) data, there were almost 36.7 million people living with HIV. Although HIV prevalence in Pakistan is low but it is considered as a high risk country. Recent data shows that there are approximately 100000 (77000-160000) people living with HIV. Out of these HIV patients 10,715 are suffering from tuberculosis. HIV increases 26 and 36 times risk of developing TB than non-infected individuals [2]. Therefore HIV infection is the uppermost risk factor which enhances the possibility of active TB from latent infection [3-5]. Active TB can occur throughout the course of HIV infection, while other opportunistic infections can occur mostly when the CD4+ lymphocytes count is less than or equal to 200 cells/mm³ [6]. Clinical manifestations of TB among HIV subjects depend on the degree of immunosuppression resulting from HIV infection. PTB most commonly occur in intact immune status (CD4+ lymphocyte count greater than 200 cells/mm³) than extra pulmonary TB [7,8].

In developing countries such as African and Asian countries, HIV-TB co-infections put forth a great pressure on health care system both diagnostically and therapeutically. In the co-infected individuals the two pathogens, Mycobacterium Tuberculosis (MTB) and HIV weaken immune system and potentiate each other, which consequence early death of untreated subjects. Across the globe approximately 14 million individuals are dually infected [9]. Approximately, one third population of the world is infected by MTB. Pakistan is ranked as

sixth most MTB infected country. It is estimated that 4,20,000 people are MTB infected, the incidence rate of MTB is 231 per 100000 [10]. The prevalence of TB can vary depending upon geographical, demographical, socioeconomically and environmental factors. There are reported very limited studies regarding the prevalence of TB/HIV co-infection in Pakistan, therefore the aim of the current study was to investigate the prevalence of PTB in HIV infected subjects in Punjab, Pakistan.

Material and Methods

Study design, period and setting

This cross sectional study was carried out in Pathology Department of Allama Iqbal Medical College Lahore. This department has a reference laboratory for CD4+ T cell count and viral load testing of HIV/AIDS subjects which were referred from different centers of Punjab AIDS Control Program (PACP). In this study, 150 HIV/AIDS treatment naïve subjects were included from February 2012 to December 2012.

Samples and data collection procedure

Both genders, male and female were included in the present study without any age restriction. Written permission was taken from all the enrolled subjects that their clinical and laboratory findings may be published in a scientific journal without disclosing their identity. Three milliliter venous blood was collected in Ethylene Diamine-Tetra-Acetic Acid (EDTA) tubes for immunological profiling which include CD4+ T lymphocytes count. Immunological profiling was done by using FACSCalibur flow cytometer.

For PTB all subjects were screened which include: (1) findings

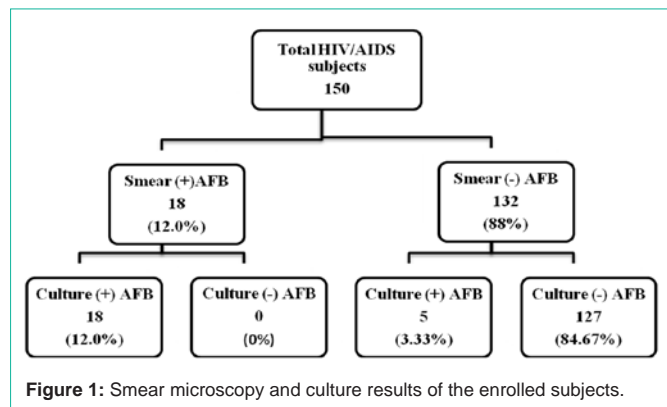


Figure 1: Smear microscopy and culture results of the enrolled subjects.

Table 1: Socio-demographic characteristics of enrolled subjects at the Department of Pathology of Allama Iqbal Medical College Lahore, Punjab, Pakistan.

Characteristics		Frequency
Age	4-20	13 (8.6%)
	21-40	110 (73.3%)
	41-60	25 (16.6%)
	61-68	2 (1.3%)
Gender	Male	98/150 (65.33%)
	Female	52/150 (34.67%)
Marital status	Married	105 (70%)
	Unmarried	45 (30%)
Employment status	Employed	71 (47.3%)
	Unemployed	79 (52.7%)
Socioeconomic status	Poor	119 (79.3%)
	middle class	31 (20.7%)

of physical examinations along with specific signs and symptoms of PTB, (2) subjects having sputum production and clinical features were requested to provide three sputum samples, and (3) posterior and anterior chest X-ray was performed and interpreted. The subjects who have not sputum production were not selected. Sputum sample was collected in a leak proof container. It was first inoculated in Lowenstein-Jensen (L-J) solid media and then smear was prepared for microscopy. A well prepared smear was stained by Ziehl-Neelsen staining technique which was further examined through microscope to confirm the presence of Acid Fast Baccili (AFB). Before inoculating sputum sample on L-J medium, it was first decontaminated by using the mucolytic agent N-acetyl L-cysteine (NALC-NaOH).

Results

A total of 150 subjects were enrolled in the current study. 18 enrolled subjects were sputum smear positive for AFB and 132 HIV/AIDS subjects were negative. All positive and negative samples were further inoculated on L-J medium. All 18 smear positive were also positive on L-J medium. Out of 132 smears negative samples, there were 5 culture positive samples. This discrepancy may be due to low sensitive method of microscopy and high sensitive methods of culture (Figure 1).

Out of 150, 98 (65.33%) were males and 52 (34.67%) were females with male to female ratio 1.8:1. The age of patients ranged between

Table 2: History of possible etiological high risk factors of acquiring HIV infection.

High risk factors	Frequency
IV drug abuse	20 (13.33%)
Sex(homo and heterosexual)	48 (32%)
Alcohol intake	5 (3.33%)
Surgery	15 (10.0%)
Blood transfusion	16 (10.67%)
HIV infected spouse	15 (10.0%)
From infected parents	7 (4.66%)
From used infected needles	16 (10.67%)
Unknown	8 (5.33%)

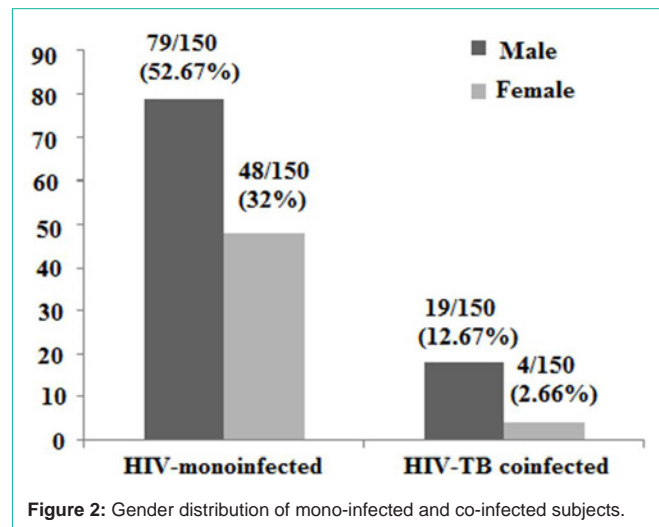


Figure 2: Gender distribution of mono-infected and co-infected subjects.

04-68 years and the mean age was 31.80. The marital status of the enrolled subjects showed that 105 subjects were married and 45 were unmarried. 71 participants were employed and 79 were unemployed. The history of enrolled subjects further revealed that 119 study participants belong to poor families and 31 were from middle class (Table 1).

A well-structured questionnaire was designed to investigate the possible etiological routes of HIV transmission. Each patient was interviewed according to this questionnaire and data of all patients was kept confidential. Among 150 study participants, 20 (13.33%) were IDUs, 48 (32%) were sexually active (both homo and heterosexual), 15 (10.0%) had the history of different surgical procedures, 16 (10.67%) had history of blood transfusion, 15 (10.0%) were infected from spouse, 7 (4.66%) had vertical transmission, 16 (10.67%) subjects gave the history of being infected from HIV infected needles, 8 (5.33%) subjects had no known history of any possible etiological route for acquiring HIV infection (Table 2).

The current study showed that 23 subjects were co-infected with PTB and HIV. Gender distribution of co-infected subjects was 19 (12.67%) males and 4 (2.66%) females (Figure 2).

The distribution of CD4+ T lymphocytes count less than 200 cells/mm³ in co-infected and mono-infected subjects was 39.13% and 25.98% respectively (Table 3).

Discussion

The immune system of HIV infected individuals is weakened and the subjects are more susceptible to other infections called opportunistic infections due to low CD4+ T cell count. CDC has

Table 3: CD4+ T lymphocytes count in monoinfected and coinfecting subjects.

CD4+ T lymphocytes count	Co-infected (HIV-PTB)	HIV mono-infected	Total
<200 Cells/mm ³	9/23 (39.13%)	33/127 (25.98%)	42/150 (28%)
200-349 Cells/mm ³	3/23 (13.04%)	25/127 (19.68%)	28/150 (18.67%)
≥350 Cells/mm ³	11/23 (47.83%)	69/127 (54.33%)	80/150 (53.33%)

listed 20 opportunistic infections that may attack HIV infected individual at any level of CD4+ T cells count leading them to the stage of AIDS. PTB is one of the most common opportunistic infection found in HIV infected subjects especially in developing countries like Pakistan. The quality and duration of HIV infected subjects can be remarkably improved by the recognition of opportunistic infections and proper treatment. This study aims to investigate the prevalence of tuberculosis in HIV/AIDS patients in Punjab, Pakistan. All HIV infected subjects were screened for PTB through clinical history, if the clinical history suggests that patient is suspected for PTB infection then sputum sample was taken for microscopic examination. In the present study, PTB prevalence among HIV infected subject was 15.3% (23/150). A similar study from a neighbor country (India) showed that 17% HIV infected subjects have opportunistic infection of PTB while remaining 83% subjects were HIV mono-infected [11]. Another study conducted in one of the major city of Tanzania in Africa also demonstrated similar results, 15% HIV infected subjects were co-infected with PTB [12].

The most common route of HIV transmissions in the enrolled subjects was sexual route (32%). It included both homosexual and heterosexual activity. The other major routes of HIV transmission were surgery and intravenous drug usage. Previous studies also demonstrated that the major route of HIV transmission is sexual activity and injection drug usage [13]. The results of the current study showed that most of HIV infected subjects have age range between 20-40 (73.3%). The major reason may be that at this stage of life individuals are sexually more active and there are more chances of acquiring HIV infection. The infection was more common in male as compared to the female (2:1). Furthermore the infected individuals were mostly married (70%). HIV infection was very much common in poor class people as compared to the middle class. The most likely reason may be lack of information and knowledge to the poor class people and that they may be easily sexually exploited.

CD4+ T cells count less than 200 cell/mm³ of co-infected and mono-infected subjects was 39.13% and 25.98% respectively. Thus with opportunistic infection of TB CD4+ T cells count was drastically lowered. A case-control study of 15 infected individuals who were taking early combination Antiretroviral Therapy (cART) and TB treatment due to HIV/TB coinfection were followed for five years in comparison with 30 HIV-monoinfected controls without TB who had similar CD4+ T cell counts and viral loads at the time of starting cART. It was demonstrated that time to CD4+ T cell increase >250 cells/mm³ was considerably slower in HIV-TB-coinfecting patients

($p=0.015$, by log rank test). Thus TB slows the rate of CD4+ T cell recovery at an early period after cART and the effects of TB on the long-term immunity of HIV-infected subjects may be the topic of further consideration [14]. In-conclusion, the current study revealed that susceptibility of PTB infection was high in HIV patients because of low immunity and in majority cases of co-infection CD4 count was lower as compared to HIV mono-infected patients.

References

- Pape JW. Tuberculosis and HIV in the Caribbean: approaches to diagnosis, treatment, and prophylaxis. *Top HIV Med.* 2004; 12: 144-149.
- World health organization Fact sheet 2016 of HIV.
- World Health Organization. *Wkly. Epid Hith Rec.* 1992; 67: 97.
- Selwyn PA, Hartel D, Lewis IA, Schoenbaum EE, Vermund SH, Klein RS, et al. A prospective study of the risk of tuberculosis among intravenous drug abusers with human immunodeficiency virus infection. *N Engl J Med.* 1980; 320: 545-550.
- Jawetz R, Melnick JK, Adelberg A. *Medical Microbiology.* 21st Edn. 279-288.
- Havilir DV, Barnes PF. Tuberculosis in patients with human immunodeficiency virus infection. *N Engl J Med.* 1999; 340: 367-373.
- Jones BE, Young SM, Antoniskis D, Davidson PT, Kramer F, Barnes PF. Relationship of the manifestations of tuberculosis to CD4 cell counts in patients with human immunodeficiency virus infection. *Am Rev Respir Dis.* 1993; 148: 1292-1297.
- Zumla A, Malon P, Henderson J, Grange JM. Impact of HIV infection on tuberculosis. *Postgrad Med J* 2000; 76: 259-268.
- Getahun H, Gunneberg C, Granich R, Nunn P. HIV infection associated tuberculosis: the epidemiology and the response. *Clin Infect Dis.* 2010; 50: S201–S207.
- Gilani SI, Khurram M. Perception of tuberculosis in Pakistan: findings of a nation-wide survey. 2012; 30: 35.
- Giri PA, Deshpande JD, Phalke DB. Prevalence of pulmonary tuberculosis among HIV positive patients attending antiretroviral therapy. *Clinic N Am J Med Sci.* 2013; 5: 367-370.
- Mtei L, Matee M, Herfort O, Bakari M, Horsburgh CR, Waddell R, et al. High rates of clinical and subclinical tuberculosis among HIV-infected ambulatory subjects in Tanzania. *Clin Infect Dis.* 2005; 40: 1500-1507.
- Ahmad F, Imran M, Yusuf NW, Atif M, Akram N, Fatima Z, et al. Clinical Manifestations of Treatment Naïve HIV Infected Patients in Pakistani Population. *Austin Virology and Retrovirology Journal.* 2016; 3: 1019.
- Ku NS, Oh JO, Shin SY, Kim SB, Kim H-W, Jeong SJ, et al. Effects of tuberculosis on the kinetics of CD4+ T cell count among HIV-infected patients who initiated antiretroviral therapy early after tuberculosis treatment. *AIDS research and human retroviruses.* 2013; 29: 226-230.