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HIV Infection and Secondary Bacterial and Fungal Respiratory Tract Infections in Central Indian Patients, as Well as a Heart Survey

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Abstract

Background: Respiratory tract infections (RTI) can cause severe morbidity and morbidity in HIV-uninfected patients with even intact full functioning immune system, and for the majority of HIV paglents, RTl are the first secondary infections which may infect even detect HIV-positivity in some of the cases. In this study attempt has been made to correlate the degree of damage to immune system of the HIV patients and different etiological agents of RTl. Naturally, in HIV-infected, Immuno-compromised patients the prevalence of routine bacteriological and fungal RTl would be more, this study is designed to know exact prevalence rate of RTl in HIV patients of this region. RTl has broad spectrum of fungal and bacterial etiology, when combined with HIV, this feature confuses the treating physician. Without knowledge of incidence of common etiological agents and their susceptibility/ pattern it is difficult for him to select the right drug for treatment.

Aim: HIV Infection and Secondary Bacterial and Fungal Respiratory Tract Infections in Central Indian Patients, as well as a Heart Survey.

Material and Method: Secondary infections of the upper and lower respiratory tract are highly common in HIV-positive patients, and the majority of them have a bacterial etiology. The respiratory tract infections of HIV-infected patients do not differ too much than HIV-uninfected patients, except in degree. This study was done on a total number of 200 sputum samples collected from ICTC and ART Center during the study period.

Results: The HIV-positive patients were the ones who had the highest polymicrobial isolation. PCP was not detected in our investigation, perhaps due to the nature of the sample, which was sputum. According to the findings of this study, Mycobacterium tuberculosis, Klebsiella pneumoniae, Candida albicans, and Pseudomonas aeruginosa are the most common opportunistic pathogens among HIV-positive people in the Central Indian regions investigated. Constant monitoring of infections in HIV positive patients is crucial for better management and to improve the quality of life of such patients, due to the changing pattern of infections based on the degree of immuno-suppression.

Conclusion: Despite the risks of side effects, the provision of highly active antiretroviral therapy in underdeveloped countries like ours should be supported, especially since these life-saving drugs are still unavailable to the vast majority of patients who require them. Even though there are certain side effects, HIV patients are advised to continue taking HAART. However, in order to manage the morbidity associated with HAART, appropriate clinical follow-up is also essential, and all of these factors may help them live longer.

Keywords: Respiratory tract infections, Immuno-compromised patients, Human Immunodeficiency Virus, AIDS and HAART

Introduction

Infection with the Human Immunodeficiency Virus (HIV), which leads to AIDS, has now become a major public health issue. With nearly 7 million individuals infected, the spotlight is now shifting to South-East Asia. According to the figures, India accounts for more than 10% of all HIV infections worldwide. Since the disease began spreading in the 1980s, a total of 13.2 lakhs (1.32 million) Indians have been diagnosed with HIV at various times. However, the most recent statistics suggest that HIV continues to spread at an alarming rate among Indians. The number of new HIV infections registered at ART centers increased from 0.302 million in 2008-09 to 0.319 million in 2009-10 and 0.317 million in the last two years.

The respiratory system is a collection of organs that work together to breathe. It is divided into two sections: the upper and lower respiratory tracts. The nose, nasal cavity, pharynx, and larynx make up the upper respiratory system, while the trachea, bronchi, and lungs make up the lower respiratory tract. Although the natural flora is normally innocuous and useful to the host, when the host's defenses are compromised, they can cause disease.[1]

Bacteria from the upper respiratory tract is washed down into the lower respiratory tract, but the ciliated epithelium and sticky mucus that coats the bronchial tube lining keep this microorganism out of the lower respiratory tract. Viruses, on the other hand, can disrupt biliary function, allowing them or other germs to infect bacteria and gain access to the lower respiratory tract. HIV, the etiological virus of AIDS, is one of these viruses. HIV reduces the number of CD4 cells in the body, producing a favourable environment for other opportunistic pathogens to infect the host.[2]

Patients with HIV infections have a variety of immunological problems, including humoral immune dysfunction, low IgA and IgG levels, and reduced T-lymphocyte cell-mediated antibody-dependent cellular cytotoxicity. Specifically in HIV infection with clinical stages III and IV, IgG2 and IgG4 levels are often decreases while levels of IgG_1 and IgG_3 are increased which in turn increases recurrent respiratory tract infections with bronchiectasis and also increases recurrent infections by encapsulated bacteria.[3,4] Once an immunological deficiency has developed, the patient is vulnerable to bacterial infections. Although monocytes, macrophages, and neutrophils play a crucial role in non-specific immunity against opportunistic infections by serving as first-line defence against extracellular pathogens, their roles are diminished in HIV infection.[5]

Naturally, in HIV-infected, Immuno-compromised patients the prevalence of routine bacteriological and fungal RTl would be more, this study is designed to know exact prevalence rate of RTl in HIV patients of this region. We also want to know at which degree of damage to immune system, HIV -infected patients develop RTl. The human immunodeficiency virus (HIV) causes acquired immunodeficiency syndrome (AIDS), which is the most significant and important public health concern of the twentieth

century.[6] Despite the fact that HIV may have arrived late or late in our country, it has spread rapidly. As a result, HIV is currently in an advanced stage of epidemic in various parts of India. The infection is concerning because of the virus's unusual pathophysiology, which causes a drop in CD4 cells, which leads to a rise in opportunistic infections in the patient.[7] Respiratory infections account for 70% of AIDS-defining disease among the numerous opportunistic infections.[8]

There are very less such studies carried out in India. Even studies on RTI along with predisposing factors were not observed in India. This study was designed to analyze the all parameters by which quality and quantity of life of HIV patients could be increased.

Material and Methods

Study design: In this study isolates/findings from sputum of 50 HIV sero-positive patients of respiratory tract infections (T group) were compared with isolates/findings 50 HIV-sero-negative patients CI (confidence interval) group of respiratory tract infections, with the purpose of finding out the difference in prevalence rates of different isolates in both the group. In this study second control group C2, the 50 HIV-sero-positive but RTI-negative patients were only questioned to fill the proforma.

Case Definition for T: Patients who were HIV-positive and had a respiratory tract infection at the time of sputum collection were considered cases. Only one patient was included in the study.

Control Definition for CI: Cl Control was defined as a patient who had a respiratory tract infection (RTI) but did not have HIV when his sputum was collected.

Control Definition for C2: C2 control was defined as an HIV-positive patient who did not have a respiratory tract infection at the time of data collection, regardless of ART status.

Criteria for Inclusion

For the HIV sero-positive patients of the group T, the patients should be: Coughing and/or drainage of discharge through nose or reduced sense of smell & tested , No history of asthma or allergic common cold ,counseled and tested positive for HIV ,Consented to participate in the study.

For the sero negative patients of group CI, the patients should be: Coughing and/or drainage of discharge through nose or reduced sense of smell & tested. No history of asthma or allergic common cold, HIV sero-negative and Consented to participate in the study

For HIV sero-positive and RTl-negative C2 control Group: Neither coughing nor having any complaints of respiratory tract infections, fever, expectoration, Counseled and tested positive for HIV, Consented to participate in the study.

Exclusion criteria

The sputum sample was considered unsuitable if it had a Bartlett's final score of 0 or less than 0. All unsuitable specimens were discarded and repeat specimens were collected. The study excluded those specimens from where yeast was isolated due to laboratory contamination or colonization confirmed on the basis of clinical correlation. Even the patients whose CD4 was not available due to any reason like patients ignorance to give blood sample separately for this test or even indifferent attitude was excluded from the present study

Specimen for study

The patients were provided a wide mouthed sterile leak-proof specimen (Sputum) container. They were instructed to go to a quiet location, take a deep breath, and cough up phlegm into the sterile container provided. Patients were instructed to deliver sputum that was free of saliva and to return the samples as soon as feasible. Patients' personal information, such as

age, gender, education, socioeconomic status, and so on, was also collected.

Processing of Sputum: The sputum quality was examined macroscopically. sputum must be thick, mucous or purulent to be considered acceptable. If the sputum sample was thin, watery, and lacking in purulent particles, it was deemed unfit for processing. The expectorated sputum was microscopically evaluated using Bartlett's grading system.

Collection of Sample: After washing the mouth with water, a deep cough was used to collect a sputum sample early in the morning. The following sputum samples were analysed at the laboratory.

1. Sample stained with Gram's stain.
2. Bacterial isolation utilizing various media such as Nutrient agar, Blood agar, Chocolate agar, Mac Coney agar, and Muller Hinton agar.
3. The isolated colony form was observed after an overnight incubation period.
4. Gram's staining of isolated colonies was repeated, followed by pathogen identification and characterization.

Result:

Table 1: Microscopic Examination of Gram stained smears from RTI Patients of group T and CI.

Observation	HIV+ve /RTI+ve(T)		HIV-ve /RTI+ve (CI)	
	(n)	%	(n)	%
Fungus +BM	25(22)	16.6(16.5)	2(4)	4.2(7.14)
Only Fungus seen	34(38)	22.6(28.5)	10(13)	21.2(23.2)
Total fungal element	25(21)	16.6(15.7)	10(14)	21.2(25.0)
GPC seen	40(32)	26.6(24.0)	9(7)	19.1(12.5)
GNB seen	26(20)	17.3(15.0)	16(18)	34.0(32.1)
Total number of patients	**150**		**47**	

BM= Bacterial Morphotypes

In the present study mixed bacterial and fungal elements microscopically were seen in 25 HIV-patients, naturally along with plenty of polymorphonuclear leukocyte (PMNL) were also seen from these group T patients, while in culture we found total 34 such polymicrobial infections with bacterial isolates along with positive fungus isolates in the HIV-patients of group T. From HIV negative patients such polymicrobial infections were seen only in three patients, but when the same samples were cultured, such mixed infections were detected from 2 patients of group Cl Microscopically we found more number of bacterial morphotypes then actually cultured, this is because some anaerobic as well some fastidious bacteria which were seen microscopically could not be isolated in culture, as we had done only routine aerobic culture.

Table 2: **Patients from both groups had similar microbial profiles (HIV reactive and HIV non-reactive patients).**

Pathogenic Isolates	HIV+ve/RTI+ve(T)		HIV-ve/RTI+ve (CI)	
	(n)	%	(n)	%
Klebsiella pneumoniae	28	17.83	11	45.8
Pseudomonas Aeuroginosa	22	14.01	02	8.33
Streptococcus pneumoniae	11	7.0	04	16.6
Escherichia coli	13	8.28	0	0
Staphylococcus aureus	10	6.36	0	0
Streptococcus pyogenus	9	5.7	0	0
Acinetobacter	7	4.45	0	0
Candia Albicans	25	15.9	1	4.16
Candida (non albicans)	30	19.1	6	25
Aspergillus	2	1.27	0	0
Total Bacterial Pathogens	**157**		**24**	

Klebsiella pneumonia isolated from 28 (17.83%) patients from HIV seropositive T group patients, while they were isolated from 11(45.8%) patients from the HIV seronegative CI group patients. Pseudomonas spp. was isolated from the 22 (14.01%) patients from HIV sero positive T group patients, while they were isolated from the 2 (8.33%) patients from HIV-uninfected. Streptococcus pneumoniae was isolated from the 11 (7.0%) and Candida albicans was isolated from 30(15.9%) patients, from HIV sero-positive T group patients, while they were isolated from 6 (25%) and 2(1.27%) patients from CI group.

Discussion

HIV/AIDS continues to spread rapidly; one in every six of the 33.6 million people living with the virus at the end of 1999 were new infections acquired in the previous 12 months, and 2.6 million people died (including half a million children). It has now surpassed tuberculosis and malaria as the leading cause of death among infectious diseases. It is the world's fourth leading cause of death (after heart disease, stroke, and respiratory disorders) and Africa's leading cause of death.

Because the better educated were more exposed to health promotion messages or more empowered to negotiate protective behaviors with sexual partners, people with higher education may have adopted risk-reduction behaviors more quickly than those with less education.[9,10]

Smokers are more likely than non-smokers to develop all HIV-associated and HIV-independent lung illnesses. This includes bacterial pneumonia and PCP, as well as asthma, COPD, and lung carcinomas.[11] Although HIV does not kill people directly, persons who have advanced HIV infection are more susceptible to other infections and cancers. These infections are referred to as "opportunistic infections" because they take advantage of the opportunity provided by a compromised immune system, and they are the leading cause of morbidity and mortality.[12] AIDS-related opportunistic infections cause significant sickness in many people.[13] HIV-associated opportunistic pneumonia, on the other hand, is more prevalent and continues to be a major source of morbidity and mortality.[14]

Bacterial, mycobacterial, fungal, viral, and parasite pneumonias/RTI are all examples of HIV-associated opportunistic pneumonia/RTI.[15] Bacterial pneumonias, also known as RTIs, are a leading cause of morbidity and mortality in HIV patients. The risk of pneumonia in HIV patients

infected with bacterial pneumonias is 10-100 times higher than in non-HIV patients.[16]

The phagocytosis of polymorphonuclear granulocytes and the bactericidal effect of serum, which is mediated in part by complement proteins, are essential for the host's defence against bacterial invasion. Complement activation via the conventional and alternate pathways has been described, however the latter appears to be the more active pathway in pneumoniae infections, as it does not require the presence of IgG directed against bacterial antigens.

Hroyuki Yoshimine et al.[17] found both Strept-pneumoniae and Klebsiella pneumoniae in 8% of patients, while Staph, aureus form 4% of the patients they had screened. **Shailaja et al.**[18] who also did not isolated a single Staph, aureus in their study and isolated 13.33% (4/30) K. pneumoniae in their study. **Hroyuki Yoshimine et al.**[17]did not find a single patient with E. coli in their HIV negative control group, even **Shailaja et al.**[18], did not find a single E.coli in their control study group, while in present study also no E. coli was isolated from HIV-negative patients.

Candida albicans were isolated from 1.33% (4/300) patients in the present study from HIV sero-negative patients, while they had been isolated from 3.33% (l/30) of the HIV negative patients by **V.V.Shailaja et al (2004)**[(21)]in their study.

Conclusion:

Despite the risks of side effects, the provision of highly active antiretroviral therapy in underdeveloped countries like ours should be supported, especially since these life-saving drugs are still unavailable to the vast majority of patients who require them. Even though there are certain side effects, HIV patients are advised to continue taking HAART. However, in order to manage the morbidity associated with HAART, appropriate clinical follow-up is also essential, and all of these factors may help them live longer. Starting HAART early would postpone the onset of AIDS, hence extending the life span of HIV patients. As we all know, HIV patients do not die of HIV, but rather of lethal secondary infections or other AIDS-related disorders that develop in the later stages of the disease.

References:

1. Mao C, Harper M, Mcintosh K, et al. Invasive pneumococcal infections in human immunodeficiency virus-infected children. J Infect Dlsl996;173:870-876.
2. Mohanty KC, Sundrani RM, Nair S. HIV Infection in patients with respiratory diseases. Indian 3 Tuber 1993; 40:5-12.
3. Park MM, Davis AL, Schluger NW, et al. Outcome of MDR-TB patients, 1983-1993: prolonged survival with appropriate therapy. Am J Respir Crit Care Medl996; 153:317-324
4. Bartlett JG. Pneumonia in the patient with HIV infection. Infect Dis Clin North Am 1998; 12:807 -820.
5. Jones N, Huebner R, Khoosal M, Crewe-Brown H, Klugman K. The impact of HIV on Streptococcuspneumoniae bacteraemia in a South African population. AIDS 1998;12:2177-2184
6. Rosen MJ, Lou Y, Kvale PA, Rao AV, Jordan MC, Miller A, Glassroth J, Reichman LB, Wallace JM, Hopewell PC. Pulmonary function tests in HIV-infected patients without AIDS. Pulmonary Complications of HIV Infection Study Group. Am J Respir Crit Care Med 1995;152;738-745.
7. Rewari BB(Ed.) Spectrum of opportunistic infections in AIDS, Chapter 11. In: Specialist's training and reference module. State Pram (Delhi) National AIDS Control Organisation, New Delhi: 111-120
8. Wallace J, Rao V, Glassroth J, et al. Respiratory illness in persons with human immunodeficiency virus infection. Am J Respir Crit Care Medl993;148:1523-1529.
9. Barnighausen T, Hosegood V, Timaeus IM, Newell ML The socioeconomic determinants

of HIV incidence: evidence from a longitudinal, population-based study in rural South Africa. Aids2007; 21:7;29-38.

10. Hargreaves JR, Glynn JR. Educational attainment and HIV-1 infection in developing countries: a systematic review. Trop Med Int Health 2002;7: 489-498.

11. HIrschtick, R, Glassroth, J, Jordan, MC, et al. The Pulmonary complication of HIV Infection. Study Group. Bacterial pneumonia in persons infected with human immunodeficiency virus. N Engl J Medl1995;995;333,845-851

12. B. Bharathi and A. U. Rani, "Pathogenic fungal isolates in sputum of HIV positive patients," Journal of AIDS and HIV Research, 3, 6,107–113, 2011.

13. Arora V K and Kumar S V Pattern of opportunistic pulmonary infections in HIV sero-positive subjects: observations from Pondicherry, India; Indian J. Chest DIs. AlliedSci. 1999;4(1):135-144

14. Frankel R, Virata M, Hardalo C, Altice F, Friedland G. Invasive pneumococcal disease: clinical features, serotypes and antimicrobial resistance patterns in cases involving patients with and without human immunodeficiency infection. Clin Infect DIs 1996;23:577-584.

15. Idoko JA, Akinsete L, Abalaka AD, et al. A multicentre study to determine the efficacy and tolerability of a combination of nelflnavir (VIRACEPT), zaicltabine (HMD) and zidovudine In the treatment of HIV infected Nigerian patients. West Afr J Med 2002; 21:83-6.

16. Muga R, Ferreros I, Langohr K, et al. Changes in the incidence of tuberculosis in a cohort of HIVseroconverters before and after the introduction of HAART. Aids 2007;21:2521-2527

17. HIroyuki Yoshlmine, Kazunori Olshi et al., Community-Acquired pneumonia in Ugandan adults: ShortTerm Parenteral Ampidllin Therapy for Bacterial Pneumonia..Am J Trop. Med. Hyg., 2001;64(3)

18. Shailaja W, Pai LA, Mathur DR, Lakshmi V. Prevalance of Bacterial and Fungal agents causing lower respiratory tract infections in patients with human immunodeficiency virus infection. Indian J Med Microbiol 2004;22:28-33.