



A STUDY ON PREVALENCE OF HIV INFECTION ALONG WITH SECONDARY BACTERIAL AND FUNGAL RESPIRATORY TRACT INFECTIONS

KEYWORDS

HIV, infection, Respiratory

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ABSTRACT

The Human Immunodeficiency Virus (HIV) infection leading to AIDS has now emerged as a major public health problem. The focus is shifting fast to South-East Asia with over 7 million people infected. According to the numbers, Indian share of total HIV infection is higher than 10% of global total. A total number of 13.2 lakhs (1.32 million) Indian with HIV have been registered at various times since the epidemic started spreading in the 1980s. The latest such numbers, however, show that HIV continue to spread at uncomfortable rate among Indians. The respiratory system is a system of organs functioning in respiration. It is made up of two parts namely the upper respiratory tract and lower tract. The upper respiratory tract consists of the nose, nasal cavity, pharynx and larynx and lower respiratory tract consists of the trachea, bronchi and lungs. The present study deals with the prevalence of HIV infection along with secondary bacterial and fungal respiratory tract infections

INTRODUCTION

Various defects in immunity occur in the patients with HIV infections, which includes defects like humoral immune dysfunction, depressed IgA and IgG levels, and decreased 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 IgG1 and IgG3 are increased which in turn increases recurrent respiratory tract infections with bronchiectasis and also increases recurrent infections by encapsulated bacteria.

Once the immune defect occurs the patient is predisposed to bacterial infections. Monocytes, macrophages and neutrophils play an important role in non-specific immunity against opportunistic pathogens by acting as first-line defense against extra-cellular pathogens, but in HIV infection the functions of these defensive mechanisms are reduced.

Even though HIV might had entered late or delayed into our country, its spread has been very rapid. So at present in our India HIV is in an advanced stage of epidemic in some state of country. The infection is alarming due to the unique pathogenesis of the virus which decreases the CD4 cells, which in turn increases incidences of opportunistic infections in the host (Rewari BB). Among the various opportunistic infections, respiratory infections account for seventy percentage of AIDS defining illness. Their relative importance differs in different parts of the world.

The upper respiratory tract contains many normal flora which include Streptococcus species, Haemophilus species, Neisseria species, Corynebacterium species, Staphylococcus species and many anaerobes such as Bacteroides. Although the normal flora is generally harmless and beneficial to the host, they can cause diseases when the host defenses are impaired.

Bacteria from the upper tract are washed downwards towards the lower respiratory tract, but the action of the ciliated epithelium and sticky mucus that cover the lining of the bronchial tubes keeps the lower respiratory tract free of these microorganism.

Viruses may however, interfere with the ciliary function, allowing themselves or other microorganisms to invade such bacteria, to gain access to the lower respiratory tract. One among such viruses is HIV, the etiological virus of AIDS. HIV decreases the CD4 cells, creating the favorable conditions or micro-environment for other opportunistic organisms to initiate many infections in the host.

Respiratory tract infections (RTI) can cause severe morbidity and mortality in HIV-uninfected patients with even intact full

functioning immune system, and for the majority of HIV patients, RTI are the first secondary infections which may in fact 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 (CD4 Count) of the HIV patients and different etiological agents of RTI. Naturally, in HIV-infected, immune compromised patients the prevalence of routine bacteriological and fungal RTI would be more, this study is designed to know exact prevalence rate of RTI in HIV patients of this region.

We also want to know at which degree of damage to immune system (mean CD4 count), HIV-infected patients develop RTI. So, as a preventive measure of these RTI, reconstitution of immune system by HAART can be started before immune system of HIV patients deteriorate below this threshold level (mean CD4 count of all HIV patients with RTI).

Respiratory diseases are one of the common problems associated with HIV infection. Patients may complain of cough, chest pain and difficulty in breathing. Fever may or may not be present. The challenge to the health care provider is knowing when to suspect that the pulmonary condition is related to an underlying HIV infection. The possibility of HIV infection should be strongly considered when the pulmonary symptoms are accompanied by manifestations such as oral thrush, oral hairy leukoplakia, progressive or significant weight loss, alopecia, skin discoloration and pruritic papular eruption.

Unusual infections, atypical presentation of common infections or severe disease should also point to a possible immune deficiency and hence should also warrant investigations for HIV. Multiple disease processes may affect the respiratory system in HIV infection and multiple pathological processes may occur simultaneously, especially in advanced immunodeficiency.

Many opportunistic infections associated with AIDS causes serious illness. However, HIV-associated opportunistic pneumonia is more common and remains a major cause of morbidity and mortality. Many patients in developing countries are unaware of their HIV infection until they present with opportunistic RTI or pneumonia, in the present study also, the mean CD4 associated with respiratory tract infections found was, to be around 339.10±84.0 cells/μl, which means RTI were the first opportunistic infections to occur in AIDS patients.

OBJECTIVES

1. To find out the extent of the problem by studying the prevalence of bacterial and fungal etiology of RTI in HIV patients.

2. To find out mean CD4 count of HIV patients for different bacterial and fungal etiological agents.

3. To determine the antimicrobial sensitivity pattern of these bacteriological pathogen causing RTI.

REVIEW OF RELATED LITERATURE

AIDS was first reported on June 5, 1981, when the U. S. Centers for Disease Control (CDC) recorded a cluster of Pneumocystis carini pneumonia (now still classified as PCP but known to be caused by Pneumocystis jirovecii) in five homosexual men in Los Angeles (Gottlieb MS, 2006). In the beginning, the CDC did not have an official name for the disease.

The earliest known positive identification of the HIV-1 virus comes from the Congo in 1959 and 1960 though genetic studies indicate that it passed into the human population from chimpanzees around fifty years earlier (Worobey M, et al, 2008).

Strain of HIV-1 probably moved from Africa to Haiti and then entered the United States around 1969. There is evidence that humans who participate in bushmeat activities, either as hunters or as bushmeat vendors, commonly acquire SIV (Kalish ML et al, 2012).

On 31st October, 1980, French Canadian flight attendant Gaëtan Dugas for first time visited to New York City bathhouses. His visit was important to history of AIDS as he would later be deemed "Patient Zero" for his apparent connection to many early cases of AIDS in the United States.

On January 15, 1981 Nick Rock died of AIDS, and he became the first known AIDS death in New York City. On 5th June, 1981, the CDC reported a cluster of Pneumocystis pneumonia in five gay men in Los Angeles (AIDS in New York).

On 4th July, 1981 CDC had reported clusters of Kaposi's sarcoma and Pneumocystis pneumonia among gay men in California and New York City (AIDS in New York, a Biography) By the end of the year 1981, 121 people were known to have died from this new disease in USA. The first known case was reported in 1981 only in United Kingdom (Dubois, R.M., et al. 2011).

India is experiencing a diverse HIV epidemic that affects states in different ways, and to different extents. India's most affected groups include injecting drug users, sex workers, truck drivers, migrant workers, and men who have sex with men. Some have predicted that India will soon be experiencing a 'generalised' epidemic, where the HIV prevalence rate - currently 0.3% among adults in India (UNAIDS, 2010) - rises above 1%.

Others have played down current estimates of the numbers infected, and have argued that, because HIV transmission in India still largely occurs among risk groups, it is unlikely that HIV will spread widely among the general population. (New York Times 2007).

Regardless of the future path of India's epidemic, it is undeniable that AIDS is having a devastating impact, and that there are still many major issues - including stigma and poor availability of AIDS treatment - that urgently need to be addressed.

METHODOLOGY

This study was done on a total number of 100 sputum samples collected.

Study design:

This is a case control study approved by institutional human research ethics committee. In this study isolates/findings from sputum of 75 HIV sero-positive patients of respiratory tract infections (T group) were compared with isolates/findings 25 HIV-sero-negative patients (C1 group) of respiratory tract infections, with the purpose of

finding out the difference in prevalence rates of different isolates in the both the group.

Even the mean CD4 was calculated for the isolates/findings from HIV-sero-positive patients to find out at which mean CD4 risk of acquiring respiratory tract infection increases for the particular isolate/finding.

In this study second control group C2, the 25 HIV-sero-positive but RTI- negative patients were only questioned to fill the proforma and their CD4 were noted from time to time, mostly at the interval of six months, in some very old cases of HIV, even their previous recorded CD4 were noted, along with the combination of ART and their side-effects.

This C2 group serves two purposes, firstly this group was used in survey of ART and secondly, it serves as the negative control group to study predisposing factors of respiratory tract infections like smoking, bio-mass fuel, age, type of residence, over crowding, contact with animals/birds etc.

Brief of Materials:

The patients were sorted in three groups. The patients with complaints of cough for more than one week and other complaints of respiratory tract infections were requested to give their written consent along with their sputum in a sterile sputum containers. These patients' blood samples were also collected in the plain bulb for testing of HIV.

If the patients HIV tests were found to be positive, they were included in T group (HIV +ve/RTI +ve), but if their HIV tests found to be negative they were included in C1 group (HIV-ve/RTI+ve). This study was a prospective observational study

Specimen for study

A wide mouthed sterile leak proof specimen (Sputum) container was given to the patients. They were asked to go to quite isolated place, take deep breath and to cough up sputum directly into the sterile container provided to them. The patients were asked to provide sputum devoid of saliva and requested to return the samples as early as possible. The sputum specimen was then transported to the Clinical Microbiology Laboratory at GMC for analysis. Patients' demographic data (required in proforma) such as age, gender, education, socio-economic condition, etc. were also taken.

ANALYSIS

The occurrence of opportunistic fungal infections has risen progressively in recent years. Invasive fungal infections had been reported in 26% of chronically and intensively immune suppressed patients (Topley and Wilson's 2005). Infections with Candida albicans appear when CD4 count is between 500-200 cells/μl and may be the first indication of immunodeficiency. In the present study the mean of CD4 count for C. albicans was found to be 257.12+ 82.86 cells/μl, while the mean CD4 count for non-albicans Candida was found to be 499.73+196.24 cells/μl in HIV infected patients with RTI of group T. Aspergillus infection were only seen in tremendous immunosuppression with CD4 count when decreases below 50.

In the present study the mean CD4 for Aspergillus was found to be 29.00+2.16 cells/μl, which matches well with the findings of other workers. The phagocytic cells and lymphocytes (T & B both) are believed to function together in protecting the host against fungal pathogens but the exact degree to which each is involved is not yet fully known. It has been shown that vegetative hyphal structures of Aspergillus and Candida are ingested and killed by neutrophils.

In the present study Candida albicans were isolated from 4.89% (47/961) of HIV-infected patients with RTI of group T. This matches well with the findings of V.V.

Aspergillus was isolated from 0.3%(3/961) patients from HIV-infected patients of RTI, in the present study, while they had been isolated in 2% patients in the study. Non-albicans Candida were isolated from 29% of patients while C.albicans were isolated from just 26% of patients in study which showed the change in the trend of candida infections towards non albicans spp.

In the present study also non-albicans Candida were isolated in 6.56% (63/961) HIV-infected patients, while C.albicans were isolated from 4.89% (47/961) patients of the same group proved changed trend of candida infection towards nonalbicans Candida. This changed trend is due to resistance to fluconazole developed by non-albicans spp. like C.krusei and C.glabrata. As fluconazole is commonly used antimycotic drug for prophylaxis.

CONCLUSION

The range of HIV associated opportunistic pneumonia/RTI is broad and includes bacterial, mycobacterial, fungal, viral and parasitic pneumonias/RTI. Among them bacterial pneumonias or RTI are a main cause of morbidity and mortality in HIV patients. In patients with HIV who are infected with bacterial pneumonias, the risk of pneumonia is 10-100 times greater than non-HIV persons. The HIV infection decreases the CD4 cells, signaling the emergence of opportunistic and non-opportunistic type of pulmonary infections.

Host defense against bacterial invasion depends on phagocytosis by polymorphonuclear granulocytes and the bactericidal effect of serum, mediated in large part by complement proteins. Both classic-pathway and alternate-pathway complement activation have been described, but the latter, which does not require the presence of immunoglobulins directed against bacterial antigens, appears to be the more active pathway in K pneumoniae infections.

Recent data from preclinical studies suggest a role for neutrophil myeloperoxidase and lipopolysaccharide-binding protein in host defense against K pneumoniae infection. Neutrophil myeloperoxidase is thought to mediate oxidative inactivation of elastase, an enzyme implicated in the pathogenesis of various tissue-destroying diseases.

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