Tuberculosis co-infection in HIV infected persons of Kathmandu

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ABSTRACT

Tuberculosis is itself a major Public health problem in Nepal and the emergence HIV further complicated the issue. A cross-sectional analytical study was conducted Between January 2004 and August 2005, with a general objective to determine the Tuberculosis co-infection status in HIV/AIDS cases of Nepal. Altogether 100 HIV infected persons visiting different Voluntary counseling and testing centers (VCT) and HIV/AIDS care centers located in Kathmandu valley were enrolled in the study. Investigation of tuberculosis was done by standard method prescribed by WHO using sputum specimen. Among 100 HIV infected cases, 66 (66.0%) were males and 34 (34.0%) were females. Majority of the HIV cases were in the age group 21-30 (60.0%) followed by 31-40 (31.0%). Tuberculosis was detected in 23 cases with highest prevalence in the age group 21-30 years (65.2%). No significant relationship could be established between gender and TB ($c2 = 0.83$, $p > 0.01$).Significant relationship was established between smoking/alcoholic habit and the subsequent development of tuberculosis ($c2 = 7.24$, $p < 0.05$ for smoking habit; $c2 = 4.39$, $p < 0.05$ for alcoholic habit at 1 degree of freedom). Among 22 culture positive isolates the predominant was *Mycobacterium avium* complex (40.9%) followed by *M. tuberculosis* (27.3%), *M.kansasii* (18.2%), *M. fortuitum* (9.1%) and *M. chelonae* (4.5%). Among the 23 cases of tuberculosis, 22 cases were diagnosed by cultural technique of which 4 cases were smear positive while the remaining one case was diagnosed by direct microscopy although it was culture negative. Smear negative Tuberculosis is found to be alarmingly higher in HIV positive individuals of productive age group. The disease significantly higher in smokers and alcoholics.

Keywords: Tuberculosis, HIV/AIDS, *Mycobacterium avium* complex, Kathmandu.

INTRODUCTION

Tuberculosis (TB), an infectious disease caused by the bacilli *Mycobacterium tuberculosis*, has become the major public health problem worldwide and one third of the world's population is infected with the bacilli.[1] Asia has the highest burden of TB in the world; every 30 seconds a person die unnecessarily of TB in Asia. The WHO South East Asia region (SEA region) is home to a third of all TB cases in the world. In 2005, of the estimated 5 million prevalent cases of TB in this region, almost 3 millions were new cases, reflecting the incidence rate of 182 per 100, 000 population.[2]

Despite the fact that tuberculosis (TB) is preventable, treatable and curable disease and its etiological agents has been discovered 125 years ago, it has become the most serious global public health problem for centuries. One of the reasons behind this failure to control TB burden is found to be due to impact of HIV on TB. This is further supported by the fact that HIV related TB continues to increase even in countries with well-organized Directly Observed Treatment Short–course (DOTS) strategy for TB control. Tuberculosis and HIV show synergistic action in such a way that HIV infection weakens the immune system of a person and tubercle bacilli can grow more easily resulting the active TB disease more easily in both persons with recently acquired and latent TB infection.[3] Because of the serious public health problem posed by tuberculosis, the World Health Organization (WHO) declared it a 'global emergency' in 1993.[1] Tuberculosis is considered as the biggest killer of people who are infected with HIV accounting one third of AIDS death globally and 40.0% of AIDS mortality with in the SAARC region.[4] The rate of progression from TB infection to active TB disease is 10-30 times higher among persons with HIV and TB infections than among persons with TB infection alone. If HIV status is negative, the life time risk of developing TB is 5.0%-10.0% but if positive with HIV, then the life time TB risk may be up to sixty percent.[5]

At the end of 2000, UNAIDS estimated 36.1 million People living with HIV/AIDS (PLWHA) globally of which one third of them were co-infected with tuberculosis, with 22.0% of these co-infected persons living with in south-East Asia.[6]

In Nepal, different studies conducted in different times regarding the prevalence of tuberculosis in HIV infected persons showed wide range of variation. In Tansen, it was observed that TB prevalence among HIV positive individuals increased from 10.8 % in 2002 to 39.5% in 2004.[7,8] In Kathmandu the prevalence of TB was found to be 22.0% during 2002.[9] Similarly, Official data of National centre for AIDS and STI control (NCASC) showed 66.0% TB among AIDS cases during 1993-2002.[10]

The very few scientific studies published are conducted in focused area of Nepal and are based on the limited number of samples in focused group of some particular areas, which may not represent national scenario and may not be sufficient for generalization in national planning purpose. So, this study has been conducted with the objectives of measuring the prevalence of tuberculosis in HIV infected persons visiting a tertiary care University Hospital with the patient coverage throughout the country.

MATERIALS AND METHODS

This study was approved by Nepal Health Research Council ethics committees and carried out by the central department of microbiology, Tribhuvan University, Kirtipur in collaboration with Tribhuvan University teaching hospital (TUTH), Maharajgunj during January 2004 to August 2005. Altogether 100 HIV infected persons visiting different Voluntary counseling and testing centers (VCT) and HIV/AIDS care centers located in Kathmandu valley were enrolled in the study. Major sampling sites included the following: TUTH VCT, Nava Kiran Plus HIV/AIDS care home, Sparsha Nepal HIV/AIDS care home , Karuna Bhavan HIV/AIDS care home , Sneha Samaj HIV/AIDS care home, Maiti Nepal, Nepal Plus HIV/AIDS care home, Vision plus VCT, SACTS-VCT, Nepal Youth HIV/AIDS care home and Blue diamond society. After taking informed consent, questionnaires were filled and then 3 sputum specimens from each person were collected. Diagnosis of tuberculosis was done by conventional methods such as direct microscopy of AFB stained smear, AFB culture and identification tests. In direct microscopy 3 sputum specimens i.e. 1st spot specimen, early morning specimen and 2nd spot specimen were collected, stained by Ziehl-Nelsen staining technique and then reporting was don according to WHO/IUATLD positively grading system. In culutral technique, early morning specimen was subjected to modified petroff's method for decontamination and then inoculated into 3.0% Ogawa medium followed by incubation at 37^{0}c for 8 weeks. In identification tests, the observation of growth rate and pigmentation, Niacin test, nitrate reductase test and catalase test were performed according to WHO manual, 1998.[11]

The data obtained from questionnaire and biochemical test results were entered into SPSS 11.5 and c2 tests and other relevant statistical tools were applied.[12]

RESULTS

Among the studied 100 HIV infected persons, 66 (66.0%) were male and 34 (34.0%) were female. Majority of them were in the age group 21-30 years (60.0%) followed by 31-40 years (31.0%), the mean and median age being 30 years and 28.2 years respectively. Tuberculosis was detected in 23 HIV/AIDS cases and the age group 21-30 years were predominantly co-infected (65.2%) followed by the age group 31-40 years (26.1%). The dual infection was higher in males (Male: Female = 17:6) but the values were statistically insignificant (c2 =0.83, p> 0.01). Significant relationship was established between the smoking/alcoholic habit and the subsequent development of TB ((c2 = 7.24, p<0.05 for smoking habit and c2=4.39 and p<0.05 for alcoholic habit) as shown in Table-1.

Table-1: Socio-demographic characteristics of TB/HIV cases

Variable		TB presence (23) N (%)	TB absence (77) N (%)	X^2 , 1 df
Age group (Yrs)	11-20	0	2 (2.6)	
	21-30	15 (65.2)	45 (58.4)	
	31-40	6 (26.1)	25 (32.5)	
	41-50	1 (4.3)	4 (5.2)	
	51-60	1 (4.3)	1 (1.3)	
	Mean age ± SD Age range	30.3± 7.7 22 to54	29.9 ± 6.9 17 to 52	-
Sex	Male	17 (73.9)	49 (63.6)	
	Female	6 (26.1)	28 (36.4)	0.83 (p>0.01)
Smoking	Yes	15(65.2)	26 (33.8)	
	No	8 (34.8)	51 (66.2)	7.24 (p<0.05)
Alcohol	Yes	12 (52.2)	22 (28.6)	
	No	11 (47.8)	55 (71.4)	4.39 (p<0.05)

Table-2: Distribution of different *Mycobacterium* species in HIV cases

Species	Number of Isolates	Percent (%)
M. avium Complex (MAC)	9	40.9
M. tuberculosis	6	27.3
M. kansasii	4	18.2
M. fortuitum	2	9.1
M. chelonae	1	4.5
Total	22*	100

*One species could not be identified because it was culture negative

Among the 22 isolates the predominant species was *M avium* complex (9 isolates, 40.9%) followed by *M tuberculosis* (6 isolates, 27.3%) as shown in Table-2. Among 23 tuberculosis cases, 22 were culture positive of which four were smear positive and the remaining one was culture negative but smear positive as shown in Table-3.

DISCUSSION

In this study the high prevalence of tuberculosis among HIV infected people (23.0%) was found. This result was almost similar to the previous studies conducted in Nepal. During 2002, Prevalence of TB among HIV infected persons was 22.0% in Kathmandu[9] where as in Tansen Mission Hospital it increased from10.8% in 2002 to39.5 in 2004. [7,8] Similarly it was observed that during 1991-2000, out of 473 AIDS cases 312 (66.0%) were co-infected with TB.[10] Our findings were also consistent with the report published by UNAIDS (1998) mentioning 22.0% TB in HIV infected persons and also with WHO's report stating that one third of HIV/AIDS patients were co-infected with tuberculosis.[6] In Nepal, our finding demonstrated that the prevalence of TB in HIV cases is either alarmingly increasing or this may represent a scenario in the capital city's tertiary care center, where most of the complicated cases visit for seeking health care. It has also observed that most of the TB HIV co-infected cases were of hospital admitted patients rather than identified from HIV/AIDS care home.

Table-3: Comparison of AFB staining and AFB culture

AFB	AFB staining	
Culture	AFB found	AFB not found
Culture positive	4	18
Culture negative	1	77
Total	**5**	**95**

The high prevalence of tuberculosis in the age group 21-30 is mainly due to 2 reasons. Firstly, the majority of the HIV infected people fall in this age group and secondly, the persons of this age group are relatively higher exposure to the outside environment. Slightly higher prevalence of tuberculosis in males than females in our study may be because males have relatively higher exposure to the outside environment than females.

It has been well established that smoking habit and unlimited use of alcohol reduces the immune response of our body.[5] In this study, it was statistically verified the significant relation between smoking habit and/or alcoholic habit and the subsequent development of tuberculosis.

One of the most important new findings of this study was the documentation of the predominance of atypical mycobacteria (mainly *M avium* complex i.e. MAC) in HIV /AIDS patients of Nepal which is in concordance with the HIV/AIDS patients of western countries where as high as 50.0% of HIV infected persons developed MAC bacteremia and disseminated infection during the course of AIDS, and most specifically when the $CD4^+$cells falls below 100/microlitre.[13] Our study has shown that smear negative TB constitute the significant proportion in HIV infected persons as obtained by several other studies.[14-16]

This study has demonstrated that tuberculosis co-infection in HIV infected persons was significantly higher (23.0%) in young adult with the habit of smoking and taking alcohol and the disease is mainly due to atypical mycobacteria (predominantly *M. avium* complex) which was rarely detected in direct microscopy. Hence, cultural technique is recommended to detect significantly higher number of Tuberculosis in HIV/AIDS cases.

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