

Prevalence of Pulmonary Tuberculosis Among HIV Infected Persons in Pokhara, Nepal

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ABSTRACT

Background: Tuberculosis (TB) is a major public health problem in Nepal. HIV co-infection has further added a serious challenge to control TB. An early diagnosis and treatment of TB in HIV infected individuals can help reduce not only the morbidity and mortality associated in this high risk group but also to control the TB burden in Nepal.

Methods: Clinical and bacteriological examination for pulmonary TB was carried out in 184 HIV positive persons from the community in Pokhara. Questionnaire was used to screen for symptoms and collect participants' demographic information and potential risk factors for TB.

Results: Eighty (43.5%) sero-positive participants were young adult (21-30 years), followed by 71 (38.6%) middle aged (31-40 years) persons. Eleven participants were found to have *Mycobacterium tuberculosis* in their sputum, giving an overall prevalence of tuberculosis of 5.97%. All 11 cases were detected by Acid Fast Bacilli (AFB) culture, of which only three cases were detected by direct microscopy of AFB stained sputum smear. The majority of TB/HIV patients were asymptomatic with low AFB smear positivity. No significant association was found between TB and risk factors like ARV status, common clinical features of tuberculosis and smoking habit. However, significant association was found between the alcohol consumption and TB ($X^2 = 4.11$, $p < 0.05$).

Conclusions: High prevalence of tuberculosis (5.97%) was found among HIV infected persons. Alcohol consumption was associated with the development of tuberculosis. Majority of the studied subjects were asymptomatic for common signs and symptoms of TB. Weight loss was observed in 43% of the studied subjects followed by chest pain (39.2%), loss of appetite (34.8%), fever (34.8%) and night sweat (26.1%). Only 27% of the TB cases were found to be smear-positive.

Keywords: HIV-TB co-infection, prevalence.

INTRODUCTION

Tuberculosis (TB) is a chronic granulomatous disease caused by *Mycobacterium tuberculosis* and HIV infection is the single greatest risk factor for TB.¹ The cell-mediated immunity is essential for defense against TB but the HIV infection impairs this immunity and causes rapid progression from recent infection to active TB disease.² HIV/TB co-infection contribute to 40% of AIDS related deaths in Asia.³

In Nepal, 45% of the population is infected with TB of which 60% are in the productive age group (15-45 yrs).⁴

This study was conducted to determine the prevalence of pulmonary tuberculosis in the HIV infected individuals at the community, document clinical presentations and identify risk factors for TB.

Since most of the existing studies conducted in Nepal on prevalence of TB in HIV infected individuals are hospital based where symptomatic patients were taken as the subjects, this is the first study to report prevalence at the community level.^{5,6}

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METHODS

A cross sectional study was conducted in Pokhara from December 2006 to December 2007. HIV-infected persons in Pokhara were provided care by a network of four non-governmental organizations (NGOs). The year preceding this study, 368 HIV positive persons were registered in four NGOs: Friends of Hope (FOH) of Ranipauwa; Community Support Group (CSG) of Damside; Nauloghunti of New Road and Paluwa of Srijana Chowk. Of 368 registered individuals, 50% were randomly selected by generating random number. Ethical approval was obtained from the Nepal Health Research Council. All participants had given the written informed consent.

All HIV positive individuals after random sampling were included for the study. However, the HIV positives who could not produce the sputum readily (including children), who visited the VCT only for one day and unable to submit the sputum next day, or who are under treatment for tuberculosis were excluded.

Participants were interviewed using questionnaire, and data was collected on socio-demographic, behavioral and clinical features related to TB. This procedure was followed by the bacterial examination of sputum in the laboratory.

Sputum collection was done in two consecutive days. The first specimen was collected on the spot. Then two containers were given to the participants to collect early morning sputum sample and on the spot in the laboratory on the second day.

Samples were collected in wide mouthed, screw capped, leak-proof, sterile sputum container. Participants were instructed to collect the sputum in the following ways; a) deep coughed-obtained from the lower respiratory tract, b) large amount of mucopurulent part-not saliva and c) adequate amount of sample-approximately 2 milliliter. In case of difficulty in getting sputum, participants were induced with heated hypertonic saline aerosol for several minutes by inhalation, and sputum was collected.

As measures of quality control, observation was made for the presence of muco-purulent portion of sputum. If specimen was without muco-purulent part then that sample was rejected and participants were requested for another sample.

After collection, the specimens were transferred to mycobacterium research laboratory at the Regional Tuberculosis Center, Pokhara. All three sputa specimen were processed for AFB staining by Ziehl Neelsen

method, and early morning sputum were subjected to modified Petroff's method for decontamination and then inoculated into two sets of 3% Ogawa medium followed by incubation at 37°C for 6-8 weeks.⁷ If the growth was obtained, the colony morphology was studied and compared with standard positive control.⁸

Those found to be smear or culture-positive after the laboratory investigations were referred to the DOTS centers of the NTP (National TB Control Program) for anti-TB treatment.

Data obtained from the laboratory results and questionnaires were entered into SPSS 11.5 (Statistical package for social sciences) for the analysis. The chi-square (χ^2) test statistics was used to evaluate the association between risk factors and TB in HIV infected individuals.

RESULTS

Among 184 HIV infected/positive persons, 110 (59.8%) were males and 74 (40.2%) were females. The age group 21-30 was predominant accounting for 43.5% (80/184) of the total followed by 31-40 years with 38.6% (71/184). 142 were married (77.2%), 71 (38.8%) had primary level education, 72 (39.1%) unemployed and 122 (66.3%) participants had acquired HIV infection through sexual means which was as high as 94.6% (70/74) in females as compared to 47.3% (52/110) in males. In contrast to the females, the males exhibited higher chance of acquiring HIV infection by sharing injections (49.1% i.e., 54/110). Table 1 and 2 summarize participants' characteristics and distribution of TB status in the study population by age group. Among 184 participants, 11 were diagnosed with pulmonary TB giving the overall prevalence rate of 5.97%. All TB/HIV co-infected persons were in the productive age group (21-40 years). The prevalence of tuberculosis was higher in males accounting for 8.18% (9/110) than in females accounting for only 2.7% (2/74) but the difference was not statistically significant.

No significant relationship was found between the development of TB and factors like ARV status and other clinical features of tuberculosis. Although smokers exhibited higher chance of developing TB (9.30% i.e., 8/86) than non smokers (3.06% i.e., 3/98) the relationship was not statistically significant. However, significant relationship was found between the alcohol consumption and TB development (Table 3).

In case of microbiological analysis of sputum, all 11 cases were detected by AFB culture, of which only three were detected by direct microscopy of AFB stained sputum smear as well. The prevalence of TB by smear positivity and culture positivity are shown in Table 4.

Table 1. Participants' socio-demographic characteristics by gender.

Characteristics	Male No. (%)	Female No. (%)	Total No. (%)
Age group (Yrs)			
1-10	1 (0.9)	0	1(0.5)
11-20	4 (3.6)	1 (1.4)	5 (2.7)
21-30	36 (32.7)	44(59.5)	80 (43.5)
31-40	50(45.5)	21(28.4)	71(38.6)
41-50	18(16.4)	7(9.5)	25(13.6)
51-60	1 (0.9)	1(1.4)	2(1.1)
Total	110(100)	74(100)	184(100)
Marital status			
Married	85(77.3)	57(77.0)	142(77.2)
Unmarried	20(18.2)	3(4.1)	23(12.5)
Widow	0	12(16.2)	12(6.5)
Divorced	5(4.5)	2(2.7)	7(3.8)
Total	110(100)	74(100)	184(100)
Education			
Illiterate	13(11.8)	38(51.3)	51(27.7)
Primary	46(41.8)	25(33.8)	71(38.8)
Secondary	45(40.9)	11(14.9)	56(30.6)
Higher Sec.	6(5.5)	0	6(3.3)
Total	110(100)	74(100)	184(100)
Occupation			
Unemployed	45(40.9)	27(36.5)	72(39.1)
Farmer	15(13.6)	20(27.05)	35(19.0)
Business	17(15.5)	6(8.1)	23(12.5)
Volunteer	12(10.9)	4(5.4)	16(8.7)
Housewife	0	11(14.9)	11(6.0)
Service	6(5.5)	2(2.7)	8(4.3)
Driver	6(5.5)	0	6(3.3)
Labor	2(1.8)	3(4.1)	5(2.7)
NGO/INGO	3(2.7)	0	3(1.6)
Student	2(1.8)	1(1.4)	3(1.6)
Other	2(1.8)	0	2(1.0)
Total	110(100)	74(100)	184(100)
HIV transmission			
Sexual	52 (47.3)	70 (94.6)	122 (66.3)
IDU	54 (49.1)	4 (5.4)	58 (31.5)
Mother to child	2 (1.8)	0	2 (1.1)
Blood	2 (1.8)	0	2 (1.1)
Total	110(100)	74(100)	184(100)

Table 2. Distribution of TB status by age group.

Age group (in yrs)	TB status		Total No. (%)
	Yes No. (%)	No No. (%)	
1-10	0	1 (0.6)	1 (0.5)
11-20	0	5 (2.9)	5 (2.7)
21-30	6 (54.5)	74 (42.8)	80 (43.5)
31-40	5 (45.5)	66 (38.2)	71 (38.6)
41-50	0	25 (14.5)	25 (13.6)
51-60	0	2 (1.2)	2 (1.1)
Total	11 (100)	173 (100)	184 (100)

Table 3. Risk factors for prevalent TB disease.

Variables	TB status		x2, 1df	
	Yes	No		
Sex	Male	9	101	1.48, P>0.05
	Female	2	72	
ARV status	Yes	3	51	0.03, P>0.05
	No	8	122	
Smoking habit	Yes	8	78	2.16, P>0.05
	No	3	95	
Alcoholic habit	Yes	7	51	4.11, P< 0.05
	No	4	122	
Chest pain	Yes	5	67	0.196, P>0.05
	No	6	106	
Night sweat	Yes	5	43	2.27, P>0.05
	No	6	130	
Weight loss	Yes	6	73	0.64, P>0.05
	No	5	100	
No appetite	Yes	5	59	0.58, P>0.05
	No	6	114	
Fever	Yes	6	58	2.01, P>0.05
	No	5	115	

*Among 184 HIV positives only 30 had done CD4 count very recently (1 week prior to sample collection), out of which 3 had TB.

Table 4. Modalities of TB diagnosis

AFB stain	AFB culture		Total (%)
	Growth (%)	No Growth (%)	
AFB found	8(72.7)	173 (100)	181 (98.3)
AFB not found	3 (27.3)	0	3 (1.7)
Total	11 (100)	173 (100)	184 (100)

DISCUSSION

There is a substantial burden of TB disease in HIV infected individuals in Pokhara, Kaski. The 5.97 % (11/184) prevalence of TB in HIV infected individuals found in this study is lower than the findings of hospital based studies conducted in Nepal. However, results are comparable to studies conducted at the community level elsewhere. A hospital based study conducted in Palpa

has documented prevalence of 10.8% of tuberculosis in HIV/AIDS persons.⁵ Another hospital based study in Kathmandu has documented prevalence of 23% (23/100) of TB in HIV positive individuals.⁶ Similarly, a study done at the voluntary confidential counseling and testing center in Cambodia has shown prevalence of 16.1% (20/124) where all HIV positive pulmonary TB patients had reported with symptoms.⁹ These variations in prevalence of TB among the HIV infected individuals could be due to the variation in the stage of HIV infection. On the other hand, community based pulmonary TB surveillances among HIV infected individuals⁷ done in Cambodia have documented 9% (41/441) of active TB in HIV infected individuals.¹⁰ Similarly, a study conducted in China in asymptomatic HIV positive individuals showed 4% (15/340) of active pulmonary disease.¹¹

In this study, majority of the participants manifested no typical symptoms of tuberculosis. This might be due to the failure to develop characteristic granuloma of immunogenic origin.¹² Our findings re-confirms that tuberculosis status among the asymptomatic HIV/TB co-infected persons could only be known through quality assured AFB cultures. TB case detection by culture technique was found to be the most effective than the direct observation of AFB stained smear which detected only three cases of TB. The finding of 27.2% (3/11) of HIV/TB co-infected persons exhibiting AFB smear positivity in this study is similar to other studies. For example, a study conducted in Kathmandu has documented 17.4% (4/23) AFB positivity.⁶ Similarly, a study conducted in India has documented 21.4% (9/42) AFB smear positivity in HIV infected individuals.¹³

It is well established that tobacco smoking and alcohol consumption reduces the immune response in human and increases the risk for TB.¹⁴⁻¹⁶ In this study we did not find prevalence of TB statistically different in smokers and non-smokers. However, the prevalence of TB was significantly higher in people who consumed alcohol compared with people who did not consume alcohol ($P < 0.05$).

Limitation of this study is that we have used only microbiological methods, but not the chest X-ray as a supportive diagnostic tool for all the HIV infected persons.

CONCLUSIONS

The prevalence of TB in HIV infected individuals in Pokhara is 5.97% (11/184). The majority of HIV/TB co-infected participants are asymptomatic with low AFB

smear positivity. Community case findings for TB could identify many undetected cases and quick treatment could limit transmission of TB. Based on the findings of this study, it is recommended that, specific guidelines regarding their investigation and treatment should be formulated and put into effect as a part of HIV care and support service. Every effort should be made to screen HIV positive persons for tuberculosis by culture methods, irrespective of the TB symptoms as adding culture test to the evaluation of an initial sputum sample set will substantially increase case detection. In addition, collaboration and coordination of TB and HIV care programs, and community based HIV-TB screening and treatment could be more effective in controlling TB from further spread in Nepal.

ACKNOWLEDGMENTS

We express our sincere thanks to all the staff of Regional Tuberculosis Center, Pokhara. We thank HIV/AIDS organizations in Pokhara for their active support and all the respondents for their cooperation. The authors express special thanks to Nepal Health Research Council for funding this study through its regional grant.

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