

Chest Radiographic Findings In Sputum Linear Positive Tuberculosis Patients And Human Immunodeficiency Virus/Tuberculosis Co-Infected Patients Treated In A Chest Unit, Enugu, Nigeria

¹Dr. Aguwa EN, ²Dr. Agwuna KK, ¹Dr. Aghaji MN, ²Dr. Okoye IJ

¹Department of Community Medicine, ²Department of Radiology
University of Nigeria Enugu Campus

Correspondence: Dr. Aguwa EN, Department of Community Medicine, University of Nigeria Enugu Campus, E-mail: enaguwa@yahoo.com

ABSTRACT

Aim: To evaluate the chest radiographic changes in patients with sputum smear positive pulmonary tuberculosis (PTB) and patients with Human immunodeficiency virus/pulmonary tuberculosis co-infection (HIV/PTB).

Materials and Methods: The study was a case-control study conducted in the chest unit of University of Nigeria Teaching Hospital, Enugu between 2000 to 2004. The cases were the HIV/PTB co-infected persons while controls were patients with only PTB. HIV status and sputum smear microscopy results were obtained from the case files while their chest radiographs (CXR), were reported by the radiologists.

Results: A total of 479 cases were studied out of which 296(61.8%) had only PTB while 183 (38.2%) had HIV/PTB co-infection. There were significantly more cavitory lesions, less hilar shadows and more upper lobe infiltrates in PTB patients compared to HIV/PTB co-infected patients ($P = 0.00$). The CXR findings were however significantly more atypical in HIV/PTB co-infected persons than in those with only PTB ($P = 0.00$).

Conclusions: CXR findings in patients with HIV/PTB co-infection are more atypical than those of patients with only PTB infection. A high index of suspicion is therefore required when an atypical CXR is observed in a HIV patient presenting with clinical signs and symptoms suggestive of TB.

Keywords: HIV, pulmonary tuberculosis, chest radiograph, cavitory lesions, infiltrates.

INTRODUCTION

Tuberculosis (TB) is a chronic infection caused by mycobacterium tuberculosis complex namely mycobacterium tuberculosis (MTB), mycobacterium africanum and mycobacterium bovis.¹ Mycobacterium tuberculosis species are the commonest cause of TB in man. The organism primarily

attacks the lungs in more than 80% of the cases leading to pulmonary tuberculosis (PTB).² Tuberculosis has continued to be a major public health problem all over the world mainly due to improper diagnosis and treatment of cases, poor drug compliance, presence of multi-drug resistant TB and lately, to the pandemic of Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome (HIV/AIDS).³

In the early stage of HIV infection in patients with PTB, the chest radiograph (CXR) is similar to those of patients with PTB alone⁴ while in advanced cases of HIV infection e.g. when the CD4 count is less than 200 cell/ml 'atypical' CXR picture is observed.^{5,6,7} However, there is no local study on radiological changes between patients with PTB infection and those who are HIV/PTB co-infected.

The aim of this study is to identify CXR changes between patients with only PTB infection and those with HIV/PTB co-infection.

MATERIALS AND METHODS

The study center is the Chest Unit of University of Nigeria Teaching Hospital (UNTH), Enugu. It is within the South Eastern zone of Nigeria. Ethical clearance was obtained from the Ethics Committee of UNTH. The study was a case control study of all the new sputum smear positive patients who were managed in Chest Unit of UNTH between 2000 to 2004. The cases that had recording of both HIV screening result and sputum AFB before starting treatment for TB, were obtained from the case files. The HIV screening result was based on the sandwich enzyme-linked immunosorbent assay (ELISA) technique for the detection of HIV antigen and of the virus associated with HIV 1 and/or HIV 2 virus in serum or plasma.⁸ For sputum AFB microscopy, three sputum samples (one spot, one early morning and another spot sputum) were collected and each of these was examined microscopically using Ziehl Neelsen Staining technique.

Data obtained were analyzed using Statistical Packages for Social Sciences (SPSS) version 11. Chi square was used to compare qualitative presentations of CXR findings.

Defining Variables:

- New PTB case: PTB patient who has never had treatment for TB or who has taken anti TB drugs for less than 4 weeks.⁹
- A smear positive TB patients: These are patients who had at least 2 sputum specimens positive for AFB or had only one sputum specimen positive and a repeat sputum examination indicates another positive sputum specimen.⁹
- Radiological classification used are similar to those used by Decock¹⁰ and Pitchenik et al.¹¹ The classifications are as follows:
 - (1) Normal CXR findings: Absence of any pathological lung shadows suggestive of PTB.
 - (2) Typical PTB findings: Presence of either or some of the following; cavitation (usually upper lobe), hilar or mediastinal shadows, upper lobe infiltrations, fibrosis, etc.
 - (3) Atypical PTB findings: Presence of either or some of the following; mid/lower zone (diffuse) infiltrates, pleural effusion, very prominent hilar or mediastinal shadows, destroyed lung, miliary shadows.

RESULTS

About 1,531 PTB patients were treated in the study centre between 2000 to 2004 and of these 841 were sputum smear positive. However only 479 (57.0%) of these were studied because they were the ones with complete data on HIV status, pre-treatment sputum result and CXR film. Among these cases, 296 (61.8%) had PTB while the remaining 183 (38.2%) had HIV/PTB co-infection. Table 1 shows the various lung shadows seen in the CXR of patients with only PTB and those with HIV/PTB co-infection. More of the patients with PTB had cavitory lesions when compared to those who had HIV/PTB co-infection ($P = 0.00$). The cavities were also located more in the upper zone in PTB patients unlike in HIV/PTB where they were more in the mid/lower zone ($P = 0.00$).

Significantly more hilar/mediastinal shadows were observed in HIV/PTB co-infected patients ($P = 0.00$). The infiltrations were more in the upper zone in PTB patients unlike in the HIV/PTB co-infected patients where they were more of mid/lower zone ($P = 0.00$). There was however no significant difference in the presence of lung collapse/ shrinkage/ fibrosis or pleural effusion. Only one case of miliary shadows was recorded and this was in a HIV/PTB co-infected patient. Table 2 summaries each patient's CXR findings and it shows that typical PTB radiological presentations were observed more significantly in PTB cases ($P = 0.00$) while in presence of HIV the CXR became more atypical.

Table 1: Lung shadows in PTB patients and HIV/PTB co-infected patients

Presentations	PTB (N=296)		HIV/PTB (N=183)		$\chi^2 = (df)$ P Value
	Present (%)	Absent (%)	Present (%)	Absent (%)	
Lung cavities	191 (64.5)	105 (35.5)	39 (21.3)	144 (78.7)	0.00
•Upper zone	161 (86.4)	-	8 (4.4)	-	
•Middle/lower zone	26 (13.6)	-	31 (16.9)	-	
Lung collapse/shrinkage/ fibrosis	139 (47.0)	157 (53.0)	84 (45.9)	99 (54.1)	0.82
Pleural effusion	63 (21.3)	233 (78.7)	47 (25.7)	136 (74.3)	0.27
Hilar/mediastinal shadows	78 (26.4)	218 (73.6)	101 (55.2)	82 (44.8)	0.00
Destroyed lung	17 (5.7)	279 (94.3)	10 (5.5)	173 (94.5)	0.90
Lung zone infiltrates	-	-	-	-	
•Upper zone	118 (39.9)	169 (57.1)	14 (7.7)	52 (28.4)	0.00
•Middle/lower zone	9 (3.0)	-	117 (63.9)	-	
Miliary shadow	-	296 (100.0)	1 (0.5)	182 (99.5)	

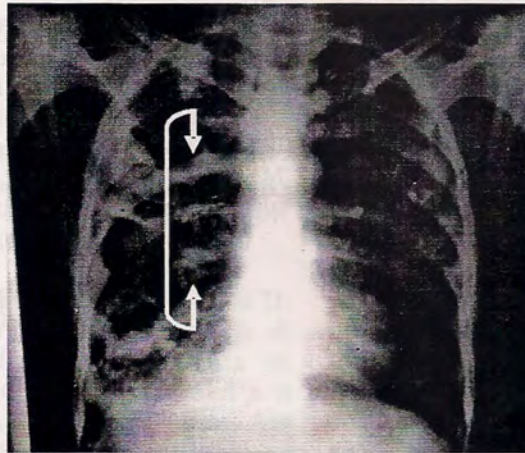
*Significant

Table 2: Summary Report of Patient's Radiological Presentation

CXR Presentation	PTB (%)	HIV/PTB (%)
Normal	17 (5.7)	4 (2.2)
Typical	198 (66.9)	56 (30.6)
Atypical	81 (27.4)	123 (67.2)
Total	296 (100.0)	183 (100.0)

$\chi^2 = 73.51, P = 0.00$ (significant)

Fig. 1: A Chest radiograph of a patient who is HIV positive and has sputum positive AFB (Atypical PTB).



Arrow shows diffused reticulonodular shadowing involving the whole of right lung field

Fig. 2 A Chest radiograph of patient who is HIV negative and has sputum positive AFB (Typical PTB)



The arrow shows right upper lung zone plus streaky shadowing

DISCUSSION

Researchers have long established that cases of PTB co-existing with advanced HIV infection often present with 'atypical' CXR pictures.¹²⁻¹⁵ The significantly higher presence of cavities, upper lobe infiltrates and hilar/mediastinal shadows observed among PTB patients in this study are similar to a retrospective study done in Cape Town, South Africa, among adult PTB cases attending HIV out-patient clinic.¹² In that study, adenopathy was observed to be the best predictor of low CD4+ T-lymphocyte count. In another report, Pitchenik and Rubinson¹¹ described a 'typical' radiographic pattern in only one (6%) of 17 AIDS patients. Also, studies in Zambia,¹³ Rwanda¹⁴ and South Africa¹⁵ had significantly more hilar and mediastinal adenopathy and less cavitations and upper zone involvement when compared to seronegative PTB patients. Cavitations occurred less frequently as the CD4 count declined.

The atypical radiological presentation especially in PTB persons with advanced HIV may be as a result of lack of an immune response. Since cell mediated immunity is necessary to control mycobacterium tuberculosis (MTB), it is possible that as the CD4 count declines the patient is unable to mount enough defences to contain the infection and an 'atypical' radiographic pattern results. This explanation is true if the TB is preceded by the presence of an advanced stage of HIV/AIDS. However in conditions of early onset of HIV i.e. where the person had PTB infection before being infected with HIV the chest radiograph may appear like those of typical PTB cases since the persons' immune reaction is still competent enough to respond to the MTB.

It is interesting to note that no significant difference was observed in the occurrence of pleural effusion, lung fibrosis or even in destroyed lung pathology. Previous reports have also not been consistent on the relationship of CD4 count and pleural effusion. Some studies established that pleural effusion, though regarded as a marker of early clinical HIV disease^{12,16} occurred even when the lymphocyte counts are low and its presence was less helpful for prediction of HIV stage of disease.⁶ Radiological difference between non PTB and AIDS patients with PTB have been observed not only in tuberculous mycobacterial infection but also in non-tuberculous mycobacterial disease of the lung e.g. from organism like mycobacterium avium-intracellulare and mycobacterium

xenopi.¹⁷

CONCLUSION AND RECOMMENDATION

Chest radiographs become more atypical in HIV/PTB co-infection making diagnosis of PTB in places with high HIV prevalence more difficult. Hence a high index of suspicion is necessary when 'atypical' CXR pictures are observed in HIV patients who present with clinical signs and symptoms suggestive of PTB e.g. cough and haemoptysis. Chest radiograph is also useful not only in the assessment of severity and extent of the disease but also in the monitoring of progress during treatment.

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REFERENCES

1. Obionu C.N. Tuberculosis: Primary Health Care for Developing Countries. Delta Publications. Enugu 2001:83-90.
2. Crompton GK, Haslett C. Diseases of the respiratory system. In Davidson's Principles and Practice of Medicine. Ed: Edwards CRW, Bouchier IAD. 17th Ed. ELBS. London. 1995: 313 405.
3. WHO. Tuberculosis and AIDS. Bulletin of the International Union Against Tuberculosis and Lung Disease. Geneva. 1989 (64): 21-9.
4. WHO. TB/HIV: A Clinical Manual. WHO. Geneva. 1996: 1-36.
5. Huebner RE, Castro KG. The Changing face of tuberculosis. An Rev. Med. 1996; 46: 47-55.
6. Post FA, Wood R, Pillay GP. Pulmonary Tuberculosis/HIV infection: Radiographic appearance is related to CD4 T Lymphocyte count. Tubercle Lung Dis. 1995: 76: 518-21.
8. Kelper MD, Benmont M, Elshami A. CD4 T lymphocyte count and the radiographic presentation of pulmonary tuberculosis. Chest. 1995; 107:74-80.

8. Nigerian Institute of Medical Research. Background document for the training modules on laboratory tests and monitoring of HIV infection. Federal Ministry of Health. 1st Ed. 2003: 31.
9. Federal Ministry of Health, Department of Public Health. National Tuberculosis and Leprosy Control Programme (NTBLCP). Worker's Manual. Modern Design Ltd. Nig. 4th Ed. 2004; 1-83.
10. Decock K. The New Tuberculosis. Africa Health. Bryan Pearson, UK. 1994; 16(3): 8-10.
11. Pitchenik AE, Robinson HA. The radiographic appearance of tuberculosis in patients with the acquired immune deficiency syndrome (AIDS) and pre-AIDS. *Am Rev Respir Dis.* 1985; 131:393-6.
12. Jones BE, Young SMM, Antoniskis D. Relationship of the manifestations of tuberculosis to CD4 cell counts in patients with human immunodeficiency virus infection. *Am Rev Respir Dis.* 1993; 148:1292-7.
13. Elliott AM, Luo N, Tempo G. Impact of HIV on tuberculosis in Zambia: a cross sectional study. *BMJ* 1990; 301: 412-5.
14. Batungwanayo J, Taelman H, Dhote R. Pulmonary tuberculosis in Kigali, Rwanda. Impact of human immunodeficiency virus infection on clinical and radiologic presentation. *Am Rev Respir Dis.* 1992; 146: 53-6.
15. Saks AM, Posner R. Tuberculosis in HIV positive Patients in South Africa: a comparative radiological study with HIV negative patients. *Clin Radiol.* 1992; 46: 387-90.
16. Elliot AM, Hayes RJ, Luo N, Pobee JOM, McAdam KP. Tuberculosis and Immunodeficiency in HIV-infected patients in Africa. *Lancet.* 1993; 342: 10 53.
17. Papillon F, Huchon G, Labrune S, Offredo-Hemmer C, Chretien J. Non-tuberculosis mycobacterial diseases of the lung in a pulmonary department: same pathogen different expression of the disease (HIV negative patients versus AIDS). *Bulletin of the IVATLD.* 1988; 63(4): 17-19.