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ORIGINAL ARTICLE

CHEST RADIOGRAPHIC PATTERN OF MULTIDRUG RESISTANT (MDR) TUBERCULOSIS CASES AT ALERT HOSPITAL, ADDIS ABABA: A RETROSPECTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Background: *Multidrug resistant tuberculosis (MDR TB) has emerged as a major challenge facing TB prevention and control efforts in Ethiopia. Chest radiograph is the primary most important imaging modality used to assist the diagnosis of pulmonary tuberculosis. Baseline information is useful to clinicians and radiologists about the chest radiographic pattern of MDR tuberculosis.*

Methodology: *A retrospective cross-sectional study was conducted at ALERT Hospital in Addis Ababa. All culture proven MDR TB patients from January 2012 to June 2014 who had chest radiographs available were included in the study.*

Results: *Chest radiograph of 128 culture proven MDR TB patients was analyzed and 72.7% (93/128) patients had abnormal chest radiographic findings among which the three most common radiographic findings were fibrosis 45 (35.5%), cavities 33(25.8%) and consolidations 22(17.2%) with most of the abnormal radiographic findings (77.4) seen in either of the upper or bilateral upper lobes.*

Conclusion*: One cannot suggest the diagnosis of MDR tuberculosis based on CXR findings alone and a "normal" CXR cannot exclude the possibility of MDR tuberculosis***.**

INTRODUCTION

Tuberculosis (TB) is a major public health problem all over the world. Ethiopia is one of the countries with a high burden of TB with prevalence of multidrug resistant (MDR) TB ranging from 0.5 to 46.3%, and with a pooled prevalence of 7.2% of both newly diagnosed and retreatment cases (1).

MDR TB is defined as resistance to both isoniazid and rifampicin, with or without resistance to other agents. There are two patterns of MDR tuberculosis. Patients diagnosed with TB who start anti-TB treatment and acquire resistance to one or more of the drugs used during the treatment are said to have developed "acquired drug resistance". This can be ascertained only if the drug susceptibility pattern is determined before the start of treatment, as well as at a later point in treatment or at the end of treatment. Patients who are diagnosed with TB and who harbor organisms resistant to one or more anti-TB drugs, but have never been previously treated for TB or have been treated for less than one month are said to have primary resistance(2).

The prevalence of MDR TB is variable in Ethiopia. The estimated annual number of MDR TB patients was 2,000 2,500 cases in 2013. The prevalence of MDR TB is increasing at an alarming rate from a baseline rate of 1.6% among new TB cases in 2005 to current level of 2.3% in 2014; similarly, the rate has increased from 11.8% to 17.8% among previously treated cases (3). Despite the country's engagement in early detection of TB, appropriate treatment of cases as well as preventing transmission to new cases, the emergence of MDR TB has become a threat to the national TB control program further complicated by the HIV pandemic.

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In addition, treatment of MDR-TB requires prolonged use of expensive chemotherapeutic agents which are more costly, less effective and have heightened toxicity than first line drugs (2).

MDR TB is among the current major medical challenges of not only developing but also of developed nations. It is now understood as a man-made problem. Although MDR TB emerges in poor tuberculosis programs resulting from inappropriate case management (3) and irregular drug supplies as well as poor adherence to treatments (4), there are also new cases (primary drug resistance) of MDR TB that emerge in individuals with no previous history of taking anti-tuberculosis drugs (5).

In most cases, if the treatment outcome of previous pulmonary TB is treatment failure or default, the current disease will most likely be MDR-TB than drug-sensitive pulmonary TB (4). Due to this fact, prevalence of MDR tuberculosis is now being used as an indicator of performance of a national tuberculosis program in a country (6). Studies also showed poor education, low income, small living space, and less fruit consumption to be associated with primary DR-tuberculosis (7).

Diagnosis is so far based on culture which has to be done for all suspected cases of MDR tuberculosis. Many studies show that there are no significant radiographic differences between drug sensitive and resistant cases. The chest radiographic (CXR) image finding in an MDR TB/HIV patient depends on CD4 count and the way infection was acquired. If patients acquire the infection through inhalation of the resistant organism they will have primary type tuberculosis and if patients acquire the infection from mutated organisms due to poor adherence they will have a finding similar with post primary tuberculosis. In this study, the proportion of HIV patients is low compared with that in other studies (8). Even if CXR is one of the well-established and important tools in the diagnosis of tuberculosis in most cases and supporting the diagnosis in some, its role in predicting the presence of MDR TB is not well known. three or more cavities exit (10).

The most common CXR pattern of MDR tuberculosis is of nodal disease (9). Patients with MDR tuberculosis are also more likely to have cavitary lesions than drug sensitive tuberculosis cases. Cavities in MDR-TB are more likely to be multiple, and larger in size. Multiple cavities are common in MDR-TB patients. The probability of MDR-TB is high when

We therefore conducted this study to evaluate the different CXR findings in patients with MDR tuberculosis.

METHODOLOGY

This was a retrospective study conducted by reviewing patient record of MDR tuberculosis cases. The study was conducted at ALERT Hospital in Addis Ababa, Ethiopia. All patients who were already admitted with culture proven MDR TB and who had chest radiographs treated in ALERT Hospital during a two and half year period (from January 2012- June 2015) were enrolled in the study, and the CXR taken before the start of MDR tuberculosis regimen was considered for interpretation. One hundred twenty (85%) patients had fulfilled the inclusion criteria. Data were collected with a structured format. The CXRs were reviewed and data were filled, and all the interpretations were done by the principal investigator (experienced consultant radiologist). Data were then analyzed using SPSS version 16.

Ethical clearance for the conduct of this study was obtained from the Ethical Review Committee of the Department of Radiology, Addis Ababa University, and permission to conduct the study was also obtained from ALERT Hospital where the study was conducted.

RESULTS

From the 128 cases who fulfilled the inclusion criteria, 78(60.9%) were male and 50(39.1%) female. The age range was 8-62 yrs with a mean age of 28.9 yrs and the majority of patients were in the age range of 20-29 yrs (Fig. 1).

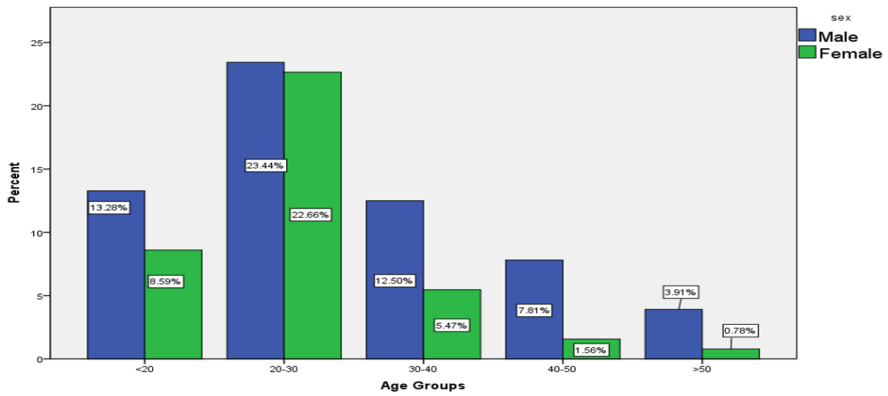

Figure 1. Age and sex distribution of MDR tuberculosis cases at ALERT Hospital from January 2012-June 2014.

All patients were screened for HIV and 17(13.3%) patients were seropositive. The CD4 count was recorded for only 9(7%) cases.

The chest radiograph revealed that 93 (72.7%) patients had abnormal chest radiographic findings. Among the abnormal CXR findings 45(35.5%) had fibrosis, 33(25.8%) had cavitary lesions and 22 (17.2%) had consolidations (Figure 2). Among 45 patients with pulmonary fibrosis 10 had associated volume loss.

Among the cavities, 8(6.3%) had a thin wall (wall thickness measured <4mm) and 25 (19.5%) had a thick wall (wall thickness measured ≥4mm). Among the total of 33 patients who had cavities, 18 (54.4%) were HIV negative, while 15 (45.6%) were positive. Pulmonary nodules were found in 7.8% of patients, and all the nodules were multiple.

Among the lung parenchymal findings, 77.4% were found in either of the upper lung zones or bilaterally in the upper lobes and the rest were distributed in the middle and lower lung zones (Table 1).

Enlarged hilar nodes were seen in 8 (6.7%) cases among which 6 were unilateral with 5 being on the right side. Only two cases had bilateral enlarged hilar nodes.

The chest radiographic findings in HIV positive MDR TB patients were similar with those of HIV negative patients; with fibrosis as the commonest pattern. However, among the 35 cases who had normal CXR findings, 31 (88.6%) were HIV negative.

Pleural thickening and/or pleural effusions were seen in 13 (10.1%) cases. Complications such as bronchiectasis and bullous lesions were seen in 6 (4.7%) and 10 (7.8%) cases, respectively, with no zonal predilection for bronchiectasis; but 70% of the bulla were seen in either of the upper lobes.

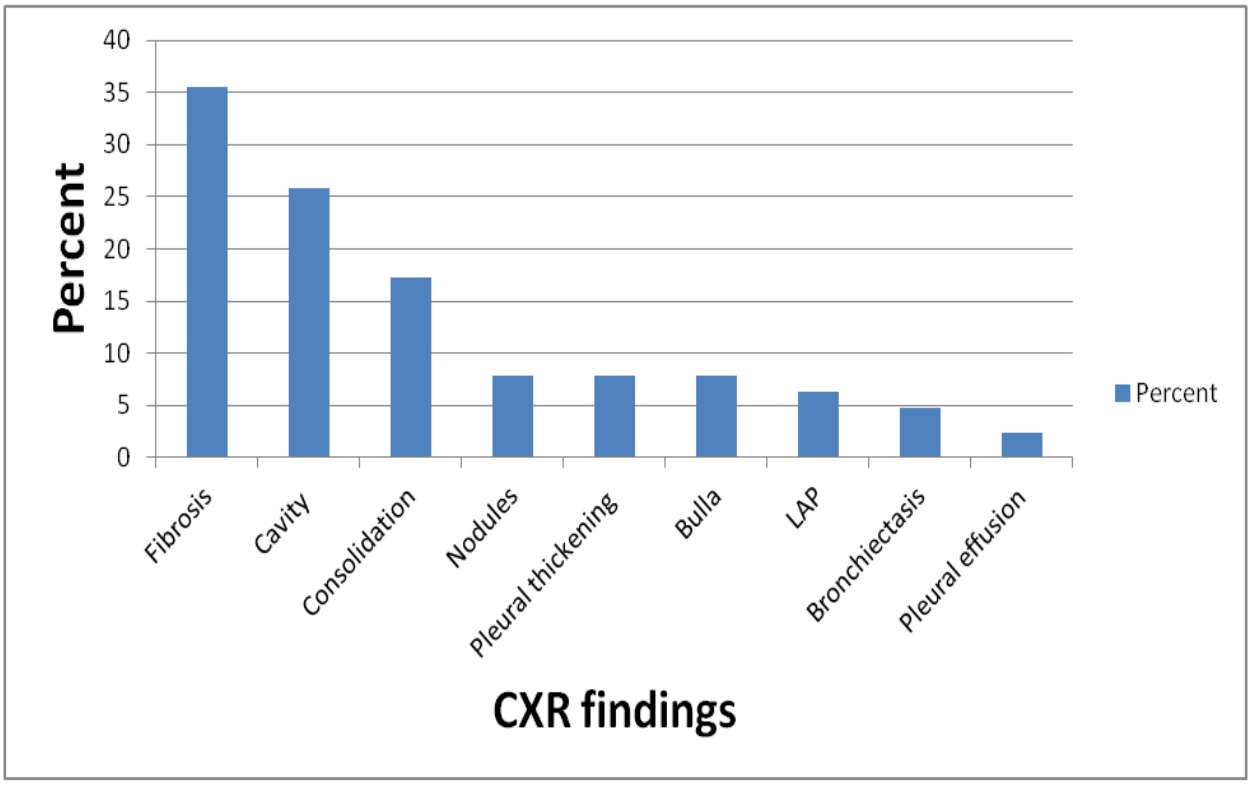

Figure 2. Chest X-Ray findings of MDR tuberculosis cases at ALERT Hospital from January 2012 - June 2014.

Table I. Zonal distribution of abnormal Chest X-Ray findings and radiographic patterns in MDR tuberculosis cases at ALERT Hospital from January 2012-June 2014

Zonal distribution	Radiographic patterns				
	Fibrosis	**Cavitation**	**Consolidations**	**Nodules**	**Total**
RUL-zone	13	13	5	4	35
RML-zone	2		2	1	5
RLL-zone		2	2		4
LUL-zone	13	11	4	3	31
LML-zone	1	3	4		8
LLL-zone		2	5		7
BUL- Zones	11	2	1	2	16
Total	40	33	23	10	106

DISCUSSION

Even if CXR is one of the most important tools in the screening and diagnosis of pulmonary tuberculosis, its value in predicting the possibility of MDR TB is not well known. Parenchyma fibrosis, cavities and consolidations were the three most common radiographic findings among our cases. Most of the MDR TB cases were in the reproductive age group (20-39yrs) accounting for 64.1% of the total cases.

Most patients with MDR TB, despite high rates of HIV co-infection and immunodeficiency had severe pathology on baseline radiograph. Mediastinal and/or hilar nodal disease is the most common radiographic finding in most studies followed by consolidations and cavitation (9).

Fibrosis was the commonest radiographic feature of MDR TB in our series, and hilar nodal disease was reported for only 6.3% of cases. Patients who had extensively drug resistant tuberculosis also had lower rates of hilar nodal disease than those who were drug sensitive or had MDR TB (5). The reason behind this discrepancy might be because only postero-anterior (PA) chest radiograph was reviewed, and lateral chest radiographs, which could add to the diagnostic value particularly in evaluating hilar nodes, were not taken in all patients. The long delay in the diagnosis and initiation of treatment in our cases may also result in ongoing chronic inflammation and fibrosis of the lung.

Additionally, the high prevalence of pulmonary fibrosis in our cases will cause associated volume loss and hilar traction which may obscure hilar or mediastinal enlarged nodes.

The other reason may be that our patients came late in the disease process. The treatment failure rate in our country is high compared with that in other countries and several patients are subjected to repeated treatment. Moreover, culture is only done in few centers and most patients are subjected to repeated treatment with conventional anti tuberculosis drugs if they do not respond to the initial treatment because of lack of options.

Radiographic features among the few HIV positive and negative cases in our study were similar with fibrosis as the commonest finding. Only few HIV cases had CD4 counts determined and we could not therefore evaluate imaging at different CD4 values.

CONCLUSION AND RECOMMENDATIONS

The most common CXR feature of MDR tuberculosis in our study was pulmonary fibrosis, and nodal disease, which was found to be common in other studies was not common in our series. So routine use of lateral CXR should be done in those with suspected MDR tuberculosis. The chest radiographic pattern in HIV positive and HIV negative MDR TB patients was similar.

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