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TB CO-INFECTION WITH HIV/AIDS: A UNIQUE RADIOLOGICAL PRESENTATION AT LACOR HOSPITAL - A POSTCONFLICT NORTHERN UGANDA.

Kitara, D.L.*[1], Pirio, P.[2], Acullu, D.[3], Opira, C.P.[3]

*[1]Gulu University, Faculty of Medicine, Department of Surgery, Gulu, Uganda.[2]Department of Medicine, St. Mary's Hospital Lacor and Gulu University Gulu, Uganda.[3]Department of Radiology, St. Mary's Hospital Lacor and Gulu University, Gulu, Uganda.

***Corresponding author's E-mail:** klagoro@gmail.com.

Abstract

Background: Tuberculosis infection is thought as having the capacity to develop at any stage of HIV/AIDS infection. Pulmonary tuberculosis and extra-pulmonary tuberculosis are major complications in HIV/AIDS. Tuberculosis is still a diagnostic dilemma in low resource countries, with approximately 68.4% of all active pulmonary TB cases being negative for AAFBs on sputum. Additionally, it is reported that 46.7% of the active cases have disseminated TB with extra-pulmonary TB; further complicating the diagnosis in low resource communities. We therefore sought to clinically, histologically and radiologically characterize the various TB diagnosed in HIV/AIDS patients in Northern Uganda.
Materials and Methods: A prospective cohort study was conducted on 320 sero-positive patients at Lacor Hospital. Clinical, histological, radiographic and ultra-sonographic features of confirmed HIV sero-positive patients with suspected TB co-infection were assessed. Patients were recruited consecutively and Chest, thoraco-lumbar and lumbar spine radiographs were taken and analyzed. Trans-thoracic ultrasonography for justified cases with pleural and pericardial effusion was conducted. FNAB and Tru-cut biopsies were performed for histological confirmation. Cases were followed-up for clinical outcomes within 2 months. Ethical review committee of Gulu University approved the study.
Results: Atypical PTB chest x-ray findings: reticulo-nodular infiltrates 223(69.7%); hilar and mediastinal adenopathy 128(40%); pleural effusion 88(27.5%) and miliary 66(20.6%). **Typical PTB chest x-ray findings:** Apical reticulo-nodularities and fibro-cavitations 88(27.5%) and normal Chest x-ray 7(2.2%). **Abdominal Ultrasound findings:** porta-hepatis, para-aortic and splenic hilum lymphadenopathy 51(15.9%); Ascitis 26(8.1%); TB splenitis 17(5.3%) and TB nephritis with peri-renal abscess 1(0.3%). PTB was observed in 171(53.4%); disseminated TB in 135(42.2%) and EPTB in 14(4.4%). The majority 262(81.9%) of the patients improved and was discharged on DOTS while 58(18.1%) died.
Conclusion: Imaging assessment is an important modality in TB/HIV/AIDS co-epidemic diagnosis. It is useful in making early diagnosis and prompt management of TB/HIV/AIDS co-infection.

Key words: Tuberculosis, HIV/AIDS, co-infection, clinico-radiological methods, Lacor, Gulu (Uganda).

Introduction

HIV/AIDS remains one of the major global public health problems of unparalleled dimensions; although unknown 30 years ago, it has already caused an estimated 25 million deaths worldwide and has generated profound demographic changes in the most heavily affected countries (UNAIDS, 2013; AIDA, 2008; Raviglione, 1995). In most heavily affected countries, HIV has reduced the life expectancy of the population by more than 20 years, slowed economic growth, and deepened household poverty (UNAIDS, 2013; AIDA, 2008). The natural age distribution in many nationals in the sub-Saharan Africa has been dramatically skewed by HIV/AIDS, with potentially perilous consequences for transfer of knowledge and values from one generation to the next (UNAIDS, 2013; AIDA, 2008; Raviglione, 1995; UNAIDS, 2011; Dorrington, 2001; WHO, 1994).

Though the target of this virus is the immune system, the frequency of abdominal disorders in patients with HIV/AIDS has been reported to be only second to pulmonary diseases (UNAIDS, 2013; Raviglione, 1995; Whalen et al., 1995). Pulmonary and abdominal manifestations may now be on the increase with diverse patterns because of the discovery and use of Highly Active Anti-retroviral Therapy (HAART) which has prolonged the life expectancy and improved the quality of life (UNAIDS, 2013; Raviglione, 1995; Whalen et al., 1995).

Mycobacterium tuberculosis (MTB) is known to be one of the world's most prevalent and deadliest infectious microbe killing an estimated three million people every year (Raviglione, 1995; WHO, 1994; Whalen et al, 1995; Vallop et al., 1991). It has been observed in the past two decades that there has been an unprecedented resurgence of tuberculosis within both developed and developing countries; and HIV/AIDS is the major indicator contributing to this increased incidence (Awil, 1997).

World Health Organization estimates that about 8.8 million new cases of tuberculosis now occur annually world-wide, and that 8.4% of these are HIV/AIDS associated (WHO, 1994; Awil, 1997). The situation is presently at its peak in sub-Saharan Africa, where previous high incidence of tuberculosis has been reportedly rising since 1980s (WHO, 1994). It is further observed that TB is still a diagnostic dilemma, with approximately 50% of all active pulmonary cases being negative for Acid-Alcohol Fast Bacilli (AAFBs) on sputum Ziehl Neelsen stain (Raviglione, 1995; UNAIDS, 2011; Whalen et al., 1995; Vallop et al., 1999; Nimfa, 2002). Additionally, 20% of all active cases may have extra-pulmonary TB (EPTB), thus complicating further its diagnosis in sub-Saharan Africa, where multiple infectious diseases affecting the chest and abdomen are prevalent (Raviglione, 1995; WHO, 1994; Whalen et al., 1995). In TB/HIV/AIDS co-infected patients, about 70% of all TB patients may have disseminated and EPTB component (Awil, 1997; Burwen, 1995; Zumla, 1999; Lacor, 2007; Nimfa, 2002).

It has been noted that HIV/AIDS has greatly expanded the differential diagnosis of patients with disseminated EPTB and therefore sifting through the various diagnostic possibilities was a major challenge in this low resource country and patients with dual infections may not present with the usual clinical, radiological features and laboratory findings of TB however, typical presentations of FB can still be seen. Furthermore, studies in Europe report a change in the disease pattern, mainly based on chest x-ray (CXR) radiographic pattern (Sunderam et al., 1986; Pitchenik, 1995; Chaisson, 1987), Africa (Batungwanayo, 1992; Greenberg, 1994; Mlika-Cabanne, 1995) and Uganda (Kawooya, 2000; Eriki, 1991). Sometimes, the CXR radiograph may be normal despite a positive sputum smear for AAFBs but TB/HIV/AIDS co-infection is known to have a wide variety of clinical manifestations from involvement of various organs (chest, abdomen, bone, brain etc) (Nimfa, 2002).

The pattern of clinical presentations of abdominal tuberculosis has remarkably changed (Nimfa, 2002; Obajimi, 2008; Sharma, 2007); the emergence of multi-drug resistant bacilli on the other hand, and the rapid spread of HIV/AIDS have posed newer threats and added a new dimension to the control of TB (Nimfa, 2002). Early diagnosis and prompt management of TB among HIV/AIDS patients ensure longer life and reduces morbidity (Vallop et al., 1999; Awil, 1997; Zumla, 1999; Lacor, 2007; Nimfa, 2002).

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In Northern Uganda, with a population of about 6-7 million, HIV/AIDS prevalence is very high, fluctuating between 8-12% and this may be mainly because of the two decades of civil war (Lacor, 2007). The TB prevalence is equally high at about 8% and TB co-infection amongst people leaving with HIV is estimated to be 45-50% (Lacor, 2007).

This enormous increase in TB/HIV/AIDS co-epidemic is a double tragedy to the fragile health care system in Northern Uganda (Uganda) and this makes case detection and management of TB worrisome (Lacor, 2007).

It became crucial for the researchers to clinically and radiology characterize the various pulmonary and extra-pulmonary TB manifestations and patterns and how this versatile TB can be diagnosed in a rural Hospital setting in order to improve case detection and management, based on the locally available resources and taking into account the lack of quality laboratory services.

This study therefore provided the basic information regarding the condition of TB/HIV/AIDS co-infection in patients at St. Mary's Hospital Lacor, and considered the state of HIV/AIDS patients with TB co-infection in general not just the CXR features. Knowledge of the outcome of this study will help clinicians implement changes that would further improve case detection, management and planning for TB prevention programs in low resourced rural Hospitals.

Materials and Methods

Setting

This study was conducted in St. Mary's Hospital -Lacor in northern Uganda. This hospital is one of the regional hospitals in Northern Uganda and is a teaching hospital for Gulu University Medical School. It is a 550 bed hospital with a catchment area extending from South Sudan, Democratic Republic of Congo and the population of northern, eastern and western Uganda. The hospital is located in Gulu district which is 340 km from the capital, Kampala. The population that attends the services at Lacor hospital are mainly rural and have been affected by the 20 year old civil war in which nearly 90% of the population were displaced into the infamous internally displaced peoples camps (IDPCs) for security and kept in congested environment and lacked the basic health services and amenities.

Design

A prospective cohort study was conducted over a period of one year (July 2009 to July 2010). A sample size of 320 cases was found to be sufficient to evaluate the clinico-radiological pattern in TB/HIV/AIDS co-infection with a power of 80% and confidence interval of 95%.

Patients' selection

Patients were consecutively selected. Inclusion criteria included confirmed diagnosis of HIV/AIDS; above 12 years of age; patients who have been in Northern Uganda within the last one year; suspected TB cases and informed consent. Those that did not meet the inclusion criteria were excluded.

Data collection

An evaluation of clinico-radiological and histological findings and patterns in HIV/AIDS clients with TB co-infection and suspected TB co-infection was conducted by specialist physicians, surgeons and radiologist at the hospital as the research team. HIV assay on (Determine, Stat Pack and Unigold) was used to determine the HIV status; clinical and imaging diagnosis was used for Mycobacterium tuberculosis and on workup to confirm TB co-infection of any type.

A focused socio-demographic feature (age, sex, district, social and physical surrounding, occupation, marital status and educational levels) were elicited and documented on coded questionnaires.

Clinical history; symptoms and signs (fever, cough, chest pain, difficulty in breathing, abdominal pain/tenderness, general malaise, cervical/axilla/inguinal adenopathy, oral thrush, wasting, back pain/spine and joint pain/swelling) were evaluated and the findings were documented in the coded questionnaires.

The radiographic, ultrasonography and ultrasound guided fine needle aspiration biopsies (FNAB) and Tru-cut needle biopsies (TRU-CUT Biopsy) were performed for those with justified clinical indications.

Materials

Heavy duty X-ray machine (Phillips) with maximal 125kVp was used for plain radiography and Modern Ultrasound machine (Esaote MyLab 70 X-Vision 2008 with a curvilinear probe (3-5MHZ)) and high frequency linear probe (7-12MHZ) were used for the various abdominal, small parts and chest echography.

Automated (BARD MONOPTY 22mm) seventeen gauge (17G) Tru-cut biopsy needle was used for tissue biopsies (for the spleen, liver, kidney, lymph-node, and other masses) and a twenty two (22mm) fine needle was used for fine needle aspiration biopsies (FNAB).

Procedures

The principal investigator and co-investigators performed all the plain radiography (PA-CXR, Antero-posterior and lateral spinal x-ray and joint x-ray) and did all the echocardiography (trans-abdominal ultrasonography, chest, transthoracic echocardiography and joint ultrasonography). The radiographic and ultra-sonographic findings were synthesized and documented on coded questionnaires.

Those patients who required ultrasound guided (aseptic technique) intervention (Tru-cut/ FNA) biopsies for cyto/histological diagnoses were controlled. Assay of laboratory bleeding and clotting parameters were done and accepted when were found within the acceptable ranges.

Trans-abdominal USS guided biopsies for intra-abdominal organs with lesions (spleen, renal, lymph-node and Liver) were done in supine position under aseptic technique to reach the definite diagnosis (cytology/histology diagnosis). The external area of intervention was swabbed with antiseptic (iodine solution) and draped with sterile towel with a window. The selected appropriate transducer (curvilinear probe 3-5MHZ) for deep lesions and (high frequency linear probe 7-12MHZ) for superficial and/or small/fine lesions were used respectively.

The transducer was sheathed with condom and a second look trans-abdominal USS scan was done in two planes (longitudinal and transverse) at the quadrant of interest to localize the target and acquire the appropriate window of low vascularity or free of large vessels with the aid of color doppler. The acquired real time images were analyzed, saved and printed.

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The skin, subcutaneous tissue and abdominal muscles infiltrated with 5-8 mls of 1% lidocaine. After about 3 to 5 minutes, a pin point skin deep incision was made and using a free hand technique an automated ready (cocked), Tru-cut needle biopsy gun was inserted and guided under real time ultrasound visualization in two planes until the echo-genic tip just reached the target.

The biopsy gun was then fired and desired tissue sample harvested. The tissue slice was removed gentle from the biopsy gun bevel (sample notch) and placed into a small correctly labelled specimen bottle containing 5mls of 10% of formaldehyde as preservative and was sent to the pathologist for examination with a completed histology request form. The procedure of Tru-cut biopsy was repeated and targeted to acquire the second tissue slice but at a different angle and plane of the lesion and therefore a second sample was harvested and placed in the same specimen bottle. The intervention site was dressed with sterile gauze, the patient admitted in the respective ward overnight for observation of vital signs and given oral analgesics (Diclofenac 50mg 8 hourly for 48 hrs).

Fine needle aspiration cytology (FNAC) was conducted in some of the cases (cervical, axilla inguinal, porta-hepatis and para-aortic lymphadenopathy using aseptic technique. The prepared mono-layer smear slides were quickly dipped in 95% alcohol for 5 minutes for wet fixation and the slides were allowed to air dry in dust free environment (room). The cytology laboratory request form was then completed, labeled, fixed and dried and the slides taken to cytology laboratory for cytological/histological reading.

All the radiographs interpretation, ultrasonography and biopsies were done by two (2) radiologists independently and sometimes in consultation. The cytology/histology slides were all examined by senior histo-pathologists from a team of Pathologists without borders. The data, results generated from plain radiography, ultrasonography and cyto-histopathology were then entered in the coded questionnaire.

Pulmonary tuberculosis (PTB) was therefore defined as being smear positive in at least two microscopic examinations and sputum smear positive in one microscopic examination plus an abnormal chest X-ray (CXR) consistent with TB. PTB was also defined as being sputum smear negative but with an abnormal CXR consistent with TB or sputum smear negative with persistent or worsening abnormal CXRs taken at one (1) month apart despite adequate treatment with broad spectrum antibiotics for at least two weeks.

Extra-pulmonary TB was defined as TB of any organ other than the lungs such as (pleura, meninges, abdominal system, urinary system, bones, joints and skin).

Disseminated TB was defined as the presence of TB in the lungs (smear positive, and/or smear negative with abnormal CXRs) and in at least one other body sites (abdomen, lymphnode); while

Miliary TB was defined as the presence of TB in multiple body organs including liver, spleen, lungs and confirmed on biopsy samples.

Data Analysis

SPSS software package of version 13.0 was used to analyze the data. We first conducted univariate analysis to generate frequencies and proportions and secondly bivariate analysis to determine associations between dependent and independent variables.

Ethical consideration

The study was approved by the research and ethics committee of the Gulu University Medical School. Informed consent/Assent was obtained from each patient before any procedure was conducted.

Results

Socio-demographic characteristics of patients

One hundred and seventy males (53.1%) and one hundred and fifty (46.9%) females were enrolled for the study with a male to female ratio of 1.1: 1. The age range was 14-69 years with a mean (±SD) of 34.3± 9.2 and median of 34 years **(Figure 1)**.

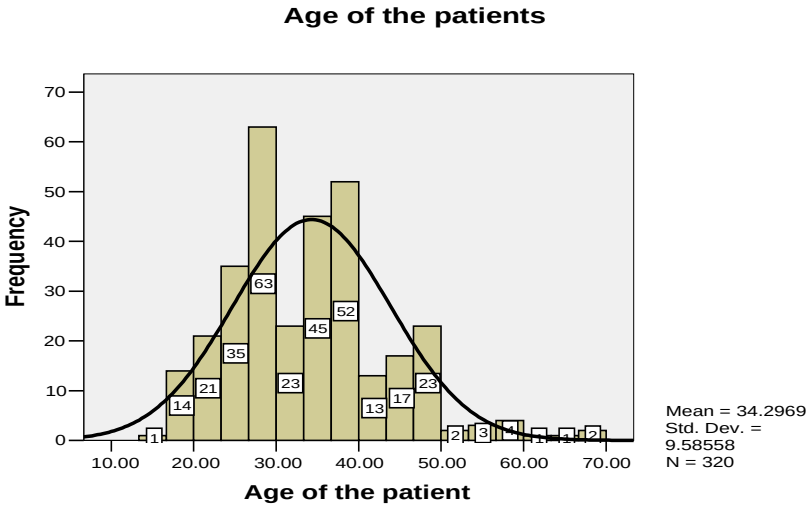

Figure 1: Shows the age distribution of the patients

Address of the patients

The majority 183 (57.2%) of the patients were from Gulu district; followed Amuru district with 57 (17.8%) and others from Pader 11 (3.4%); Lira 24 (7.5%); Apac 10(3.1%); Adjumani 10 (3.1%); Kitgum 10 (3.1%) and 13 (4%) from Masindi district.

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Table 1: Shows the radiographic characteristics in the patients

648 Radiological features in 320 patients (CXR, Spine and Joint x-rays)		
Radiological patterns	**Freq**	**%**
Normal Chest X-ray (CXR)	7	1.08
Interstitial infiltrates (reticulo-nodular patterns)	223	34.41
Alveolar opacities (Consolidations)	22	3.40
Fibro-cavitation pneumonia (cavities)	88	13.58
Miliary infiltrates	66	10.19
Hilar and mediastinal adenopathy	128	19.75
Pleural effusion	88	13.58
Pneumothorax	6	0.93
Pleuro-parenchymal fibrosis	3	0.46
Cardiomegaly with pericardial effusion	13	2.01
Thoracic and Lumbar spines with para-vertebral masses	4	0.62

Table 1 shows the distribution of radiographic features in the 320 TB/HIV/AIDS patients. Reticulo-nodular opacities (interstitial pattern) constituted the highest number 223(69.7%); followed by Hilar and mediastinal adenopathy 128(19.75%) and Fibro-cavitating pneumonia accounted for 88(13.58%); pleural effusion contributed 88(13.58%); miliary infiltrates (pattern) constituted 66(10.19%) and 7(1.08)% of the radiographs where normal, with no evidence of pleura-parenchymal lesion noted; 4(0.62%) had TB spondylosis and 13(2.01%) had TB pericarditis.

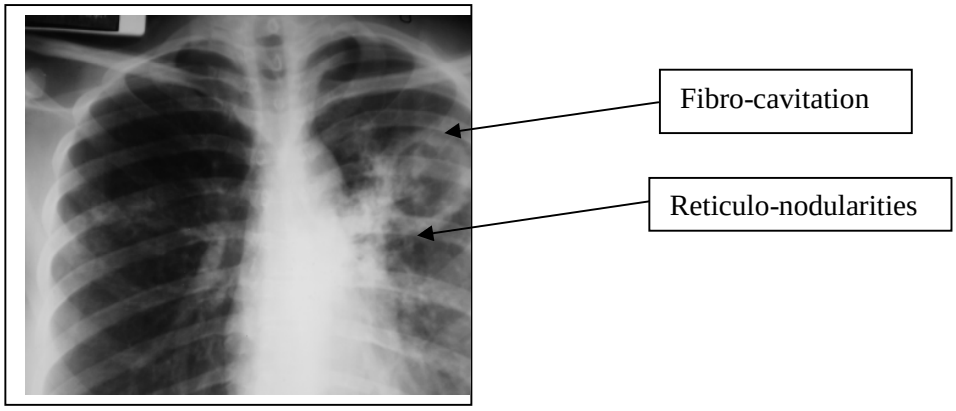

Figure 2: Chest x-ray in a 30 year old HIV/AIDS patient
This chest x-ray (CXR) shows fibro-cavitating pneumonia in a 30 year old HIV/AIDS female patient; note the left apical thick-walled cavity and middle lung zones reticulo-nodularities. The CXR pattern is typical and consistent with active secondary pulmonary TB.

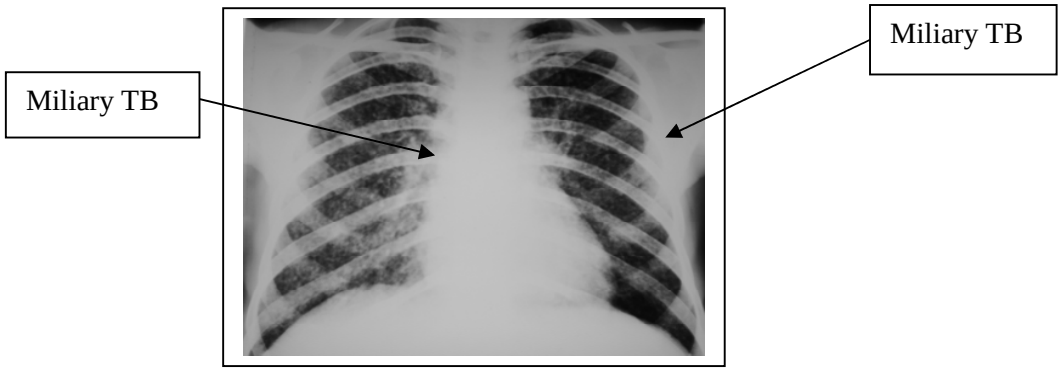

Figure 3: This shows military TB in a 28 year old HIV/AIDS patient,This CXR shows miliary TB in a 28 year old HIV/AIDS patient

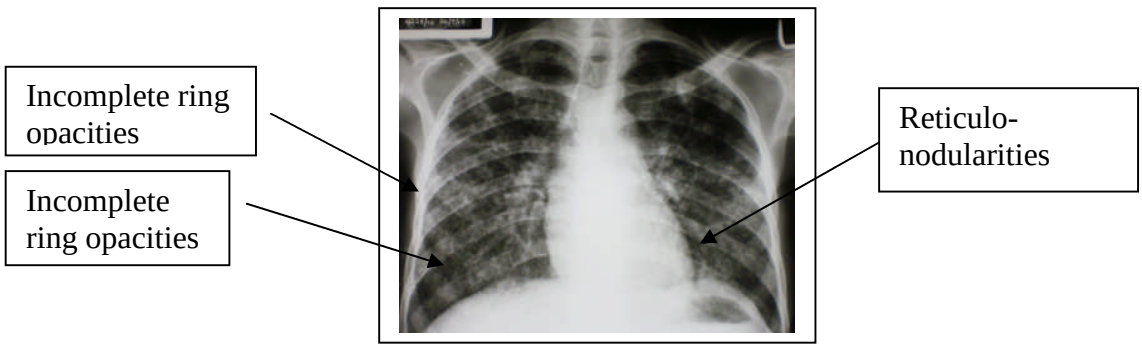

Figure 4: Chest x-ray in a 48 year old HIV/AIDS patient

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This CXR shows diffuse coarse reticulo-nodularities bilaterally; incomplete ring opacities (cavities) involving the right middle lung zone and the left lower lung zone. This is active PTB in a 47 year old male HIV/AIDS patient.

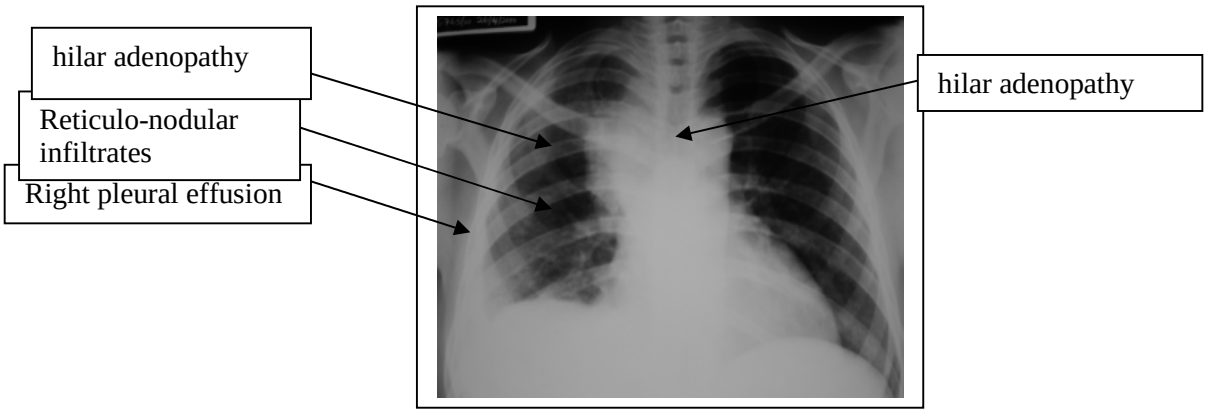

Figure 5: Chest x-ray in a 35 year old HIV/AIDS patient

This CXR shows bilateral hilar adenopathy; bilateral reticulonodular infiltrates predominantly on the right lung field and small right pleural effusion. This is an atypical CXR pattern of active TB in 35 year old male HIV/AIDS patient.

Table 2: Ultrasonographic abdominal findings, sputum smears and CD_4 Counts

s/no	Ultrasonographic appearance for abdominal conditions	Freq	%
1.0	**Liver echo-pattern**		
	Normal	302	94.4
	Hepatomegaly	12	3.8
	Fatty Liver (Steatosis)	6	1.9
2.0	**Splenic Echo-pattern**		
	Normal	293	91.6
	Splenomegaly	10	3.1
	Splenitis (TB splenitis)	17	5.3
3.0	**Kidney echo-pattern**		
	Normal	310	96.9
	RVI (Nephropathy)	9	2.8
	Renal TB (Nephritis/peri-renal abscesses)	1	0.3
4.0	**Intra-abdominal lymphadenopathy**		
	Present	51	15.9
	Absent	269	84.1
5.0	**Ascitis**		
	Present	26	8.1
	Absent	294	91.9
6.0	**CD_4 counts for the patients**		
	10-200 cells per ml	208	65
	201-500 cells per ml	80	25
	501-800 cells per ml	32	10
7.0	**Sputum smear results on ZN stains**		
	Sputum smear negative	219	68.4
	Sputum smear positive	111	31.6

Seventeen patients (5.3%) had micro-splenic abscess (diffuse, more or less equal sized, hypo-echoic small nodularities) TB splenitis. A patient (0.3%) had renal TB with peri-renal abscess.

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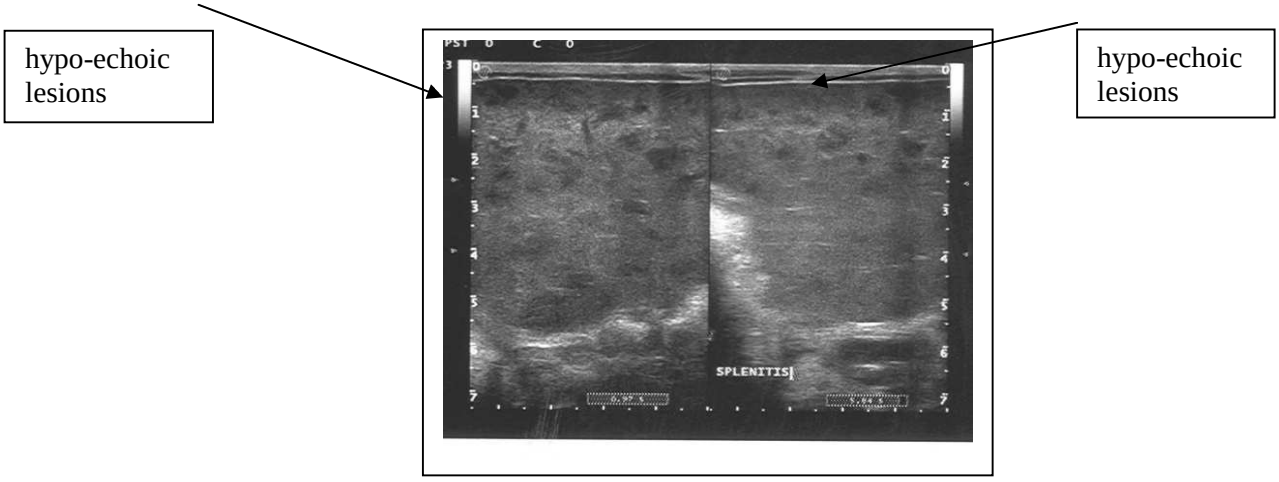

Figure 6: This USS picture of the spleen in a 28 year old HIV/AIDS patient
This sonography demonstrated a mildly enlarged spleen riddled by multiple small irregular hypo-echoic lesions of varied sizes in a 28 year old female HIV/AIDS patient. Tru-cut Biopsy was done and histology result confirmed TB splenitis.

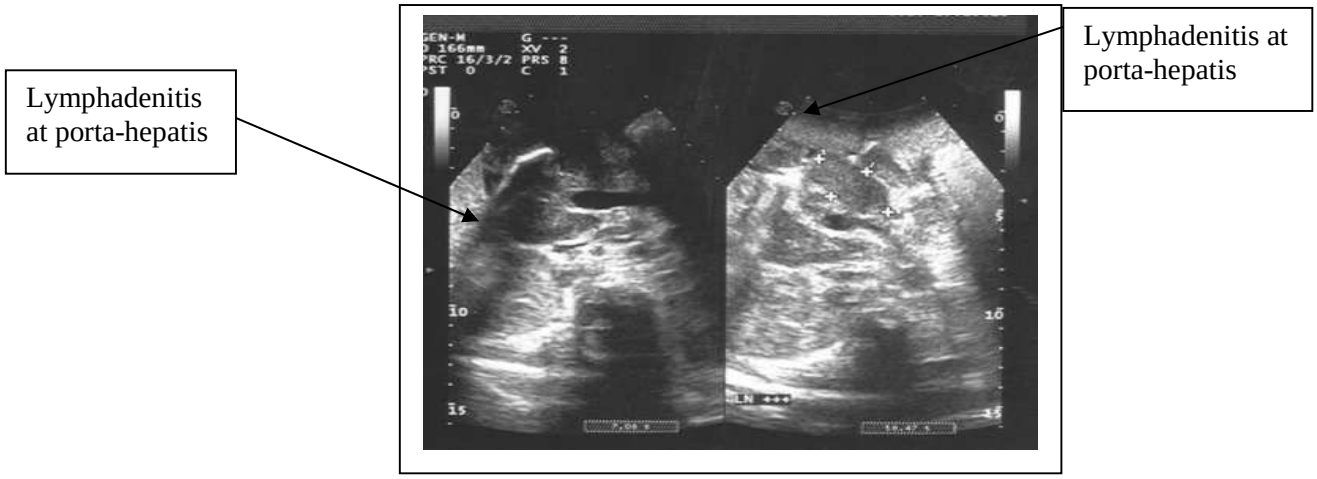

Figure 7: Ultrasound finding of the lymphnode in a 56 year old HIV/AIDS patient: This sonography demonstrated a hypo-echoic oval porta-hepatis mass (lymphadenitis) measuring 2.1 x 1.7 cm in a 56 year old male HIV/AIDS patient. This same patient had miliary pattern on a CXR.

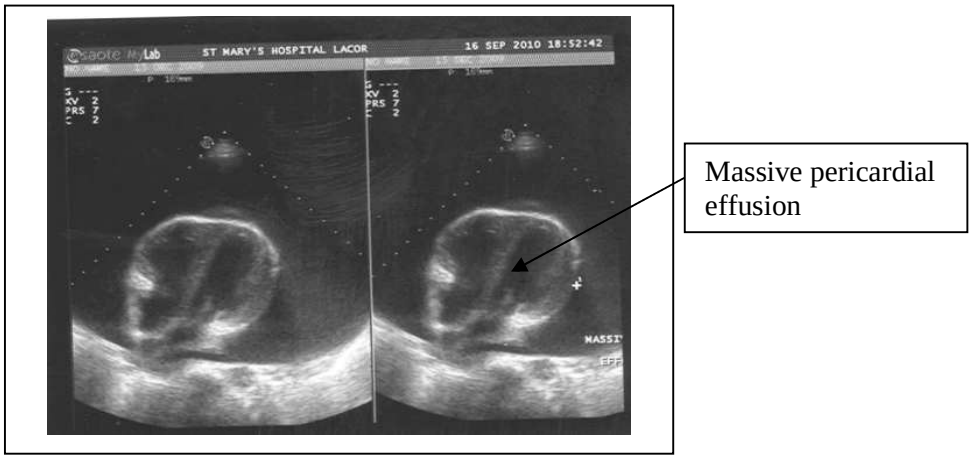

Figure 8: Echocardiography in a 12 year old HIV/AIDS patient: This sonography shows massive pericardial effusion measuring 7.5cm in thickness in a 12 year old female HIV/AIDS patient and with associated fine internal echoes and fibrin-like network and the pericardiocentesis was haemorrhagic. The finding confirmed TB pericarditis in this patient.

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Summary of findings: PTB accounted for 171(53.4%) of active TB in HIV/AIDS patients, 135(42.2%) were disseminated TB and EPTB contributed 14(4.4%).

Outcome of treatment: The majority 262(81.9%) of the patients improved and were discharged on Directly Observed Therapy Short-course (DOTS) treatment and 58(18.1%) patients died.

Discussion

TB is a contagious and an airborne disease (Riley, 1983) and it is a disease of poverty that thrives where social and economic determinants of ill health prevail; it affects mostly young adults in their most productive years and 95% of TB deaths are in the developing world (Philippe, 2013). Furthermore, about one third of the world's population is estimated to be latently infected with TB bacteria (WHO, 2012). Notably, it has been observed that only a small proportion of those infected becomes sick with TB (Borgdorff, 2011; Vynnycky, 2000) and people with weakened immune systems have a much greater risk of falling ill and in particular, a person living with HIV/AIDS is over 15 times more likely to develop active TB (Philippe, 2013).

It has been observed that the prevalence of HIV co-infection in patients with TB is highest in the African Region and the Region accounts for almost 80% of HIV-positive TB cases worldwide (Philippe, 2013). Among people living with HIV/AIDS, 3.2 million were reported to have been screened for TB at their latest health visit in 2011, and 0.46 million of those without active TB were provided with Isoniazid preventive therapy (IPT) (Philippe, 2013).

TB has therefore become one of the most important HIV/AIDS opportunistic infections world-wide and it is one of the leading causes of death among people living with HIV/AIDS (WHO, 1994; Whalen et al., 1995; Vallop et al., 1999). Whereas patients with HIV/AIDS associated TB mostly have typical clinical features, the frequency of the atypical m status of advanced immune-suppression therefore, making diagnosis more difficult (Whallen et al.,2011; Vallop et al., 1999).

The male to female ratio in this study was 1.1:1; which showed a near unity in sex distribution of TB/HIV/AIDS co-epidemic in northern region (Uganda). However, the slight male predominance could be because, male were observed to be more involved in risky social and sexual behavior, with multiple heterosexual partners and poor health seeking behavior leading to delay in HIV diagnosis and initiation on HAART which may have increased the chances of TB opportunistic infection (Kitara et al, 2012). This finding was in agreement with other findings in other parts of the world (Lee, 2000; Habib, 1998; Wokoma, 1997).

The mean age of the patients in this study was (34.3±9.6) years similar to those observed in other studies (Habib, 1998; Wokoma, 1997; Hsieh, 1996) (Figure 1). This confirmed results of previous observations that HIV/AIDS was more common in persons in their productive and sexually active age groups which was similarly observed in other studies (Lacor, 2007; Woodring, 1986; Obajimi, 2008; Rodrigo et al., 2008; Philippe, 2013).

Most patients in Northern Uganda with TB/HIV/AIDS co-infection were significantly immune-compromised with over sixty percent of the patients with CD_4 cell counts ranging between 10 to 200 cells/ml) (table 2); and they had various degrees of malnutrition and overwhelming secondary infections with Malaria, Pneumonia, gastroenteritis, bacteriaemia and Septicaemia (table 2). These situation were probably aggravated by poor living conditions (post-war) and compounded by the poor health seeking behavior among the population (Lacor, 2007; Kitara et al., 2012).

It was important to note that about a third of TB/HIV/AIDS co-infected patients in this population presented with chest radiographs typical of post-primary TB (chronic or reactivation tuberculosis**)** with fibro-cavitations (table 1). Fibro-cavitations were similarly noted in other previous studies in Africa and particularly Uganda (Nimfa, 2002; Sharma, 2007; Di Fiori, 1998; Chaisson, 1987; Eriki, 1991). Therefore, significant burden of HIV- related tuberculosis was probably due to reactivation of the latent infection and progression of chronic disease as a result of immunodeficiency (table 2).

In Northern Uganda, as it is true for Uganda and Africa as a whole, TB control efforts focuses on effective treatment of smear positive patients. From this present study, it was evident that majority of HIV/AID patients with TB co-infection were smear negative **(table 2)** with other cases having disseminated TB and Extra-pulmonary TB. It was observed that active case finding was not being undertaken in these communities nor was chemoprophylaxis of infected but non-diseased individuals being carried out routinely in most of the region (Lacor, 2007). Whilst this approach may decrease the transmission of infection, it was not likely to prevent reactivation and progression of pre-existing tuberculosis in relation to HIV infection as observed in this study. It was observed that, the presentation of TB in early stages of HIV infection was similar to that in HIV negative patients and often resembling post-primary pulmonary TB with upper lobe reticulo-nodular infiltrates; fibro-cavitations lesion and sputum smear results which were often positive **(table 1&2)**.

During the later stages of HIV infection the presentation of TB resembled primary disease with diffuse reticulo-nodularities involving predominantly the middle and lower lung zones; miliary pattern, hilar and mediastinal lymphadenopathy; pleural effusion and the sputum smear were often negative **(table 2)**. For the disseminated TB and Extra-pulmonary TB; ultrasonography played a major diagnostic role and the commonest sites involved and easily accessed by echography were the abdomen, chest and lymph-nodes **(table 2)**.

As observed in previous studies the present study showed evidence that disseminated TB existed in many patients and a possible explanation was that extensive CD_4 cell depletion in HIV infection resulted in impaired immunity against TB, leading to the development and dissemination of active TB (Lacor, 2007; Woodring, 1986; Obajimi, 2008; Rodrigo et al., 2008). This was perhaps caused by the easier spread of the bacilli when the body's defense systems were unable to amount an efficient challenge.

Conclusion

Imaging assessment is an important modality in TB/HIV/AIDS co-epidemic diagnosis. It was useful in making early diagnosis and prompt management of TB/HIV/AIDS co-infection.

Competing Interest

Authors declare no conflict of interest

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