Abdominal ultrasonography in HIV/AIDS patients in southwestern Nigeria

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Abstract

Background

Though the major target of the HIV-virus is the immune system, the frequency of abdominal disorders in HIV/AIDS patients has been reported to be second only to pulmonary disease. These abdominal manifestations may be on the increase as the use of antiretroviral therapy has increased life expectancy and improved quality of life. Ultrasonography is an easy to perform, non invasive, inexpensive and safe imaging technique that is invaluable in Africa where AIDS is most prevalent and where sophisticated diagnostic tools are not readily available. Purpose: To describe the findings and evaluate the clinical utility of abdominal ultrasonography in patients in Ibadan, Nigeria

Methods

A Prospective evaluation of the abdominal ultrasonography of 391 HIV-positive patients as well as 391 age and matched HIV-negative patients were carried out at the University College Hospital, Ibadan.

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Results
Of the 391 cases studied, 260 (66.5%) were females; the mean age was 38.02 years, (range 15–66 years). was most prevalent in the 4th decade with an incidence of 40.4%. Compared with the HIV-negative individuals, group of patients had a significantly higher proportion of splenomegaly (13.5% vs. 7.7%; p < 0.01), lymphadenopathy (2.0% vs. 1.3%; p < 0.70), and renal abnormalities (8.4% vs. 3.8%; p < 0.02). There were no differences in pancreatic abnormalities between the HIV+ and HIV- groups. There were significantly fewer gallstones in the (1.4% vs. 5.1%; p < 0.01).

Conclusion
AIDS is a multi-systemic disease and its demographic and clinical pattern remains the same globally. Ultrasound is optimally suited for its clinical management especially in Africa. Its accuracy and sensitivity may be much improved and may prove to be of great clinical utility in developing countries, where the availability of other diagnostic methods may be limited. Further studies may be needed to establish diagnostic algorithms.

Background
The Acquired Immune-Deficiency Syndrome (AIDS), the clinical entity resulting from HIV infection is an increasingly important disease that has become a social phenomenon. The Sub-Saharan African region is by far the worst affected by the AIDS epidemic. It is actually home to over 60% of all people living with HIV [1]. Though the majority of these patients are infected through the use of this deadly virus is the immune system, the frequency of abdominal disorders in patients with AIDS has been reported to be second only to pulmonary disease [2-4]. These abdominal manifestations may now be on the increase as the use of antiretroviral therapy has prolonged life expectancy and improved quality of life [2,5].

HIV/AIDS is known to have a wide variety of clinical manifestations from involvement of various organs. Ultrasound (US) is a versatile imaging tool, which can evaluate most of the abdominal organs affected by the disease; thus, it can guide biopsies allowing the cytological and microbiological investigations needed to obtain a definitive diagnosis.

Other imaging methods particularly Computed Tomography (CT) can explore these organs in more detail and is often used as a second choice in abdominal imaging for the following reasons; it utilises less radiation, is more readily available and often yields results comparable to US [3-5].

This is particularly true in developing countries where the absence or the high cost of the procedure makes it an alternative diagnostic tool in the radiological investigation of HIV infected individuals.

To our knowledge, there is a dearth of reports in the West African Sub-region on imaging in HIV/AIDS patients. The purpose of this prospective study was to describe the abdominal findings in these patients and evaluate the clinical utility of abdominal US in HIV/AIDS patients in Ibadan, a southwestern town of Nigeria.

Methods
Abdominal ultrasound scans were prospectively performed over a one-year period (April 2005–March 2006) on consecutive eligible HIV-positive adults (aged 15–66 years) referred from the Antiretroviral Clinic at the University of Ibadan Teaching Hospital, Ibadan to the Department of Radiology for routine diagnostic imaging. At our facility, HIV-positive patients are routinely screened for chest X-ray and an abdominal US for early detection of abnormality and achievement of a baseline diagnosis. During the same period, 391 abdominal ultrasound examinations were performed on HIV-negative adults who were age and sex-matched controls. These included relations of patients, hospital staff and patients admitted for abdominal illnesses.

The ultrasound scans were performed after an overnight fast of at least 12 hours with patients lying supine a...
3.5–5.0 MHz frequency curvilinear probe on an ALOKA 1700-SSD ultrasound machine. Non-fasting patients, or patients with incomplete ultrasound examinations were excluded from the study. Two radiologists performed sonographic examinations.

The presence of the following abnormalities were noted, splenomegaly; (with or without hypo or hyperechoic hepatomegaly; (with or without single or multiple focal lesions), lymphadenopathy, gallbladder and bile duct ascites, renal abnormalities with diffusely increased echogenicity, pancreatic changes, and biliary duct dilatation. Extrahepatic bile duct was identified at the level of the portal vein, where the hepatic artery crosses perpendicular between them. When bowel gas obscured a part of the suprapancreatic segment, the patient was asked to take deep breaths and hold the inspiratory phase. Color Doppler sonography was used to confirm the identification of vascular and ductal anatomy. The common bile duct was measured in the most distal aspect of the head of the pancreas, anteroposterior measurements from inner border to inner border were obtained.

The radiologist initially recorded the data on paper and later transferred it to a computer, where it was stored during the period of the study before statistical analysis. The following definitions were used, lymphadenopathy: nodes larger than 1 cm in diameter \([6]\), splenomegaly: larger than 12 cm at its longest axis \([7]\), hepatomegaly: liver measuring more than 15 cm at its longitudinal axis, extrahepatic duct dilatation: common bile duct diameter (CBD) > 7 mm. Electronic calipers were used for all measurements on the ultrasound machine.

Demographic data were obtained from patients' record file. Each patient gave an informed consent.

**Data Management**

SPSS 11.0 for windows software (SPSS, Inc. Chicago, Illinois) was used for data analysis. Continuous variables were expressed as mean ± standard deviation with student T-test analysis for comparison. Categorical variables were expressed as percentages and comparison was by chi-square analysis. Two tailed p-value < 0.05 was considered significant.

**Results**

Of the 391 cases, 260 (66.5%) were females; the mean age was 38.02 years, (range 15–66 years). The mode was the 4th decade with a frequency of 40.4% (Table 1). Of the control group, 64% were females and 36% were males with a mean age of 36 years (age range = 15–64 years).

**Table 1. Age group distribution in HIV+ Patients**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15–24</td>
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<tr>
<td>25–34</td>
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<td>35–44</td>
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<td>45–54</td>
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<tr>
<td>55–64</td>
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<tr>
<td>&gt; 64</td>
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</tbody>
</table>

**Sonographic Findings**

The significant abdominal US findings seen are shown in Table 2. Of the study population normal abdominal findings were comparable in both groups. Splenomegaly was common in both groups, although it was considerably more common in the HIV+ group; 57 (14.6%) compared with 30 (7.7%) in the HIV- group (p < 0.01). The spleen showed homogeneous enlargement except in two of the HIV+ cases, which showed solitary hypo-echoic areas.

**Table 2. Abdominal Ultrasound Findings in 782 Nigerian Adults**

<table>
<thead>
<tr>
<th>Condition</th>
<th>HIV+</th>
<th>HIV-</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Splenomegaly</td>
<td>57</td>
<td>30</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Hepatomegaly</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lymphadenopathy</td>
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<tr>
<td>Gallbladder</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bile duct</td>
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</table>

Enlargement of the liver was also not significantly different in both groups: 52 (13.3%) in cases versus 58 (14 controls, these patients showed mostly nonspecific findings such as high parenchymal echogenicity compatible infiltration of the liver (Fig. 1). Evidence of cholelithiasis was noted in 6 (1.5%) HIV+ cases but was significant in the control group, being present in 20 of 391 (5.1%) patients (p < 0.01). Extrahepatic bile duct dilatation was also
of 391 (2.6%) cases with a mean of 4.28 ± 1.18 mm. The width of the common bile duct ranged from 1.0 to among HIV+ cases and 1.0 to 6.5 mm among the control group. No extrahepatic bile duct dilatation was recc control group.

Renal US findings were diverse, renal parenchymal changes as evidenced by increased echo texture of both c medulla (Fig. 2) were recorded in normal sized kidneys in 33(8.4%) of HIV+ cases compared with 15(3.8%) which showed similar changes (p < 0.03). Biochemical tests confirmed increased Urea level in 27% (9/33) of patients while Creatinine level was equally high in 4 of the 33 patients corresponding to those with the highest Other renal findings in both groups include hydronephrosis, nephrolithiasis, and simple renal cysts. However 1 was not statistically significant. There was also no significant difference in the renal length in both groups (Ta patient in the HIV+ group had a congenital absence of the right kidney while crossed ectopia was noted in an

Table 3. Renal measurements of 782 patients

Enlarged para-aortic and periportal lymph nodes were more common in the HIV+ group having eight (2.0%) (1.3%) in the HIV-seronegative group (Figs. 3 and 4). Free fluid (ascites) within the abdomen was seen more HIV-seronegative patients; 22 of 391(5.6%) against five of 391(1.3%) in HIV+ patients.

Discussion

HIV/AIDS has now reached epidemic proportion in all Sub-Saharan African countries endangering not just the victims but also the social and economic fabric of society. Most health institutions in the sub region including adequately equipped to properly evaluate the HIV/AIDS patient and the complications that often arise from this infectious and non-infectious complications can be overwhelming and may be impossible to diagnose accurately developing countries because of lack of diagnostic facilities [3-5]. Evaluation of the abdomen by ultrasound is alternative tool to CT scan, producing cross-sectional images of high diagnostic quality. Although US does not
definitive diagnosis, it may show areas of abnormal anatomy and pathology that may facilitate achieving a tis or add further support to the decisions on commencing empirical treatment. This is highlighted by the spectr in our study as listed in Table 3. The female prevalence and mean age of 38.02 years shows a slight variance comparable study by Tshibwabwa et al in a similar environment [3]. Their study showed a higher male preval lower mean age. Findings in our study confirm previous documentation of the wide range of abdominal manif HIV/AIDS and reveal that while abdominal abnormalities occur frequently, they are usually nonspecific, with s lymphadenopathy, biliary tract abnormalities, and hepatomegaly occurring most commonly. Splenomegaly wi common abnormal finding in our study, with a frequency of 13%. This relatively high incidence agrees with p [3,5,8,9]. Yee et al [10] and Geoffray et al [11], identified splenomegaly in 45% and 32.5% of their patients As is the case with the non-AIDS population, hepatosplenomegaly is a nonspecific finding. Other abnormalit in our study occurred far less commonly. The two cases of focal hypoechoic splenic areas may have been due lymphoma. Focal splenic lymphomas are commonly depicted as a hypoechoic lesion and are often seen in as splenomegaly [12] as in the cases identified.

However, the echogenicity of the remaining cases of splenomegaly were essentially homogeneous. In the cat patients with hepatomegaly, 49 of 52 (94%) were homogeneous. The only solid hyperechoic mass recorded v biopsied for lack of appropriate facility. This finding is at variance with the study from central Africa, [3] wh mass lesions, namely AIDS – related lymphoma, Kaposi sarcoma of the liver, diffuse nodular regenerative hy multiple hyperechoic nodules from extra pulmonary pneumocystitis carinii, and mycetic abscesses were found of these hepatic changes in our patients may suggest an improved quality of life consequent to the adminis Highly-Active Antiretroviral Therapy (HAART). There was however sonographic evidence of increased parench in 35% of this group of patients. The latter is compatible with the well documented fatty changes in AIDS pat [3,5,8,9]. According to Fortgang et al, [13] this fatty change of the liver has a low sonographic diagnostic acc could account for the possibility of underreporting in our study.

Gall bladder wall thickening was not associated with the presence of calculi. Acalculous cholecystitis was also Extrahepatic dilatation was found in 10(2.6%) patients; this finding has been reported as a sequel of AIDS Ri Sclerosing Cholangitis (ARSC) [4]. However, such patients had associated findings of gall bladder wall thicker were not demonstrated in our cases. Since these patients had no symptoms referable to the biliary system, no diagnostic procedures were performed. The cause of this finding therefore remains unknown.

Gall stones were seen significantly less in the HIV+ group, similar findings were reported by Tshibwabwa et a Africa consequently this pattern is probably common to all sub-Saharan African countries.

Ultrasound is valuable in the assessment of lymph nodes, with a 3.5 MHz. transducer; deep lymph nodes can Ultrasound allows assessment of location, number and sizes of pathological lymph nodes. It also permits eval shape, presence or absence of hilum/mediastinum. The lymph nodes recorded in our study were greater than oval shaped with an echogenic hilum and a narrow symmetric cortex suggesting that they were benign. An ul guided fine needle aspiration could have further characterized these nodes, but this could not be carried out be cause of unavailability of appropriate needles.

Ascites was reported more frequently in the HIV seronegative group. Perhaps the higher frequency in this gro due to selection bias, in that the control group was largely made up of patients on admission in the hospital. pa with surgical or other medical conditions who required screening for HIV as part of their diagnostic la up. Healthy individuals in our environment, usually even with counseling do not readily submit themselves for screening. The higher incidence of ascites in the non-HIV population is therefore most likely due to other path causes such as malignancy and cirrhosis, which are the commonest known risk factors.

The association of renal abnormality with HIV has been known since the early days of the disease [13]. In 19 [14] described progressive nephropathy in adults with HIV/AIDS, characterized by proteinuria and renal fail associated nephropathy may develop in patients with asymptomatic HIV infection, AIDS-related complex, or

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typically have mild hypertension and large kidneys and then early and rapidly progressive renal failure. Studies increased prevalence of renal complication because of prolonged survival and increased frequency of HIV transmission among Intravenous drug abusers [15-18]. The sonographic correlates of this disease are nephromegaly and increased cortical echogenicity [3,5,14,18]. The number of HIV+ cases in our study who showed such renal abnormality was greater than double the number of the controls. However, overall renal sizes were within normal limits among both groups (3). Renal failure was evident in a quarter of the cases with parenchymal changes. Nonetheless, a direct correlation between the extent of renal disease and the degree of echogenicity does not exist [19]. This strongly contrasts with the findings of previous studies [10,12,19] which found nephromegaly to be associated with HIV nephropathy, even though most common among black males [20,21]. The higher female prevalence in the study group may have accounted for this difference.

Our data supports the fact that manifestations and changes seen on abdominal ultrasound of HIV/AIDS patients are uniform across countries in sub-Saharan Africa. However, a wide range of features are seen in both HIV+ and HIV- individuals which in the absence of histological confirmation makes the clinical usefulness of ultrasound imaging limited. In experienced hands the radiologist may be able to provide a narrow range of diagnostic possibilities that might enhance patient management and care in African communities where the burden of HIV/AIDS remains astonishingly high.

### Conclusion

Ultrasonography is a versatile tool for evaluating abdominal organs affected by HIV/AIDS. The sonographic findings among HIV/AIDS patients in Ibadan, Nigeria are comparable to that from other sub-Saharan African communities. However, provision and availability of sufficient clinico-pathologic data in the future would improve the quality of ultrasound diagnosis and treatment in these patients.

### Competing interests

The author(s) declare that they have no competing interests.

### Authors' contributions

OMO and AYA conceived the study. AOM and AAM participated in its design. OYU and AAJ performed the ultrasound examinations. OSA and OMA participated in the recruitment of subjects and collated the data. AYA and IFA conceived recruitment of subjects. OMO, OGI and AAT managed the ultrasound examinations. OMO, OGI and AAT performed statistical analysis and drafted the manuscript. All authors read and approved the final manuscript.

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