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PREVALENCE OF ABNORMAL BONE MINERAL DENSITY IN HIV-POSITIVE PATIENTS IN IBADAN, NIGERIA

TO Alonge,[✉] VN Okoje-Adesomoju,[1] OM Atalabi,[2] HA Obamuyide,[3] D Olaleye,[4] and IF Adewole[5]

Department of Surgery, University of Ibadan and University College Hospital, Ibadan, Nigeria

[1] Department of Oral and Maxillofacial Surgery, University of Ibadan and University College Hospital, Ibadan. Email: vnokoje@gmail.com

[2] Department of Radiology, University of Ibadan and University College Hospital, Ibadan. Email: omatalabi@yahoo.co.uk

[3] Department of Orthopaedics and Trauma, University College Hospital, Ibadan. Email: henry.obamuyide@gmail.com

[4] Department of Virology, University of Ibadan, Ibadan. Email: davidoolaleye@gmail.com

[5] Department of Obstetrics and Gynaecology, University of Ibadan and University College Hospital, Ibadan. Email: ifadewole@yahoo.co.uk

[✉] Corresponding author.

*To whom correspondence should be addressed. E-mail: temitopealonge@gmail.com

Abstract

Background:

There have been reports of high rate of abnormal bone mineral densities (BMD) among people living with Following the introduction of combination antiretroviral therapy (CART) into Nigeria, the country is now increasing population of HIV positive patients. There is paucity of data about osteoporosis/osteopaenia an mineral density in this population.

Aim and Objectives:

The aim of the study was to determine the prevalence and determinants of osteopaenia/osteoporosis in a c of HIV-positive patients in Nigeria.

Patients and Methods:

The BMD of a group of patients attending the outpatient clinic of the University of Ibadan, Nigeria was as using a DXA machine. The relationship of bone mineral density to body weight, CART status, protease inl use, and gender was investigated. Their CD4 counts and viral load were also estimated.

Results:

A total of 1005 patients participated with a mean age of 41.3 ± 10 years. There were 724 females (72.0%) 29.7% were single. The median length of diagnosis was 2 years (Range 1-18 years). The Median CD4 cou 371cells/ml and Median viral load was 200 copies/ml. Of this sample, 785 (78.1%) were on CART with 9 (12.6%) on protease inhibitor. The mean body mass index (BMI) was 23.7±4.7 with 9.2% underweight an obese. The prevalence of osteopaenia and osteoporosis were 46.6% and 31.9% respectively, while 19.6% normal bone mineral density (BMD). Osteoporosis was significantly higher in those aged above 40 years (0.00001), the females (p= 0.022), the single (p=0.028) and the underweight (p=0.0001). There was no sig difference in BMD of those with or without protease inhibitor containing medications as well as treatment patients.

Prevalence, Nigeria

Introduction

Bone is a metabolically active organ that supports and gives form to the body in addition to performing nu other functions[1]. The shape of bone is maintained by remodeling which results from the activities of ostec and osteoclasts. After skeletal maturity, there follows a period of skeletal consolidation but peak bone ma attained at about the age of thirty-five years. Subsequently, there is a steady decline in bone mass irrespec race or sex with 0.5 to 1 percent of the total bone mass lost annually[2].

In osteoporosis, there is skeletal failure as opposed to skeletal lack and the disease can be clinically define having a lower bone mass than might be expected for age and sex and characterized by potential increase fracture occurrence[1]. Osteoporosis poses a special clinical dilemma because it does not have pathognomo symptoms and affected persons only seek medical attention when sentinel events like fractures, low back and symptomatic vertebral collapse occur. It is estimated that over 200 million women suffer from this dis

Bone mineral density (BMD) measurement is used for the diagnosis of osteoporosis as it accounts for abo of bone strength and correlates strongly with fracture risk and load-bearing capacity of the spine and hip[4] dual-energy x-ray absorptiometry (DXA) scan is the gold-standard in measuring BMD and this technique estimates the absorption of radiation by the skeleton and the values obtained are expressed in terms of T-s Z scores[2,5]. The World Health Organization outlines three classes of bone mineral densities (normal, oste and osteoporosis) based on the T-scores as calculated by the number of standard deviations below the mea values for healthy young adults (25-35 years) with sex and ethnicity matched reference population; the Z compares the BMD to an age-matched reference of the same gender and is used for patients less than 50 y old[1,6, 8].

The effectiveness of Combination Antiretroviral Therapy (CART) deployed in combating HIV infections l resulted in longevity of the survivors[7]. However, this has not come without a price. Numerous studies fro developed countries have shown a high prevalence of abnormal bone densities as well as osteoporotic frac among HIV-positive patients, especially those on CART [2,8-13]. In the meta-analysis by Brown and Qaqisl prevalence of osteoporosis in HIV-positive patients was three times higher than in HIV-negative controls[1- prevalence of abnormal Bone Mineral Density (BMD) varies in different populations, but even less is kno about the character of bone mass among HIV-positive patients in Sub-saharan Africa. Nigeria is home to 3 million people living with HIV at the end of 2012[12]. Fifty percent of these people are women aged 15 yea above. With the introduction of CART in Nigeria, the country is now home to increasing number of HIV-p patients on life-long medications and there is paucity of data on osteoporosis and abnormal bone mineral d among people living with HIV whether or not on medication. This information is vitally important for dev appropriate management protocols, mapping out preventive strategies against fragility fractures and for pl service needs. This study thus sets out to determine the prevalence of abnormal bone mineral density in a of HIV-positive patients in Ibadan, Nigeria and assess the associated risk factors.

Patients and Methods

Between 1st September and 31st December , 2010, patients with HIV infection attending the Presidential Emergency Plan for AIDS Relief/AIDS Prevention Initiative in Nigeria (PEPFAR/APIN) clinic at the Coll Medicine, University of Ibadan had their bone mineral density (BMD) evaluated after informed consent w obtained. Ethical clearance was obtained from the Ethics Review Committee. Information acquired includ demographics, weights, heights, duration of diagnosis and duration of HIV therapy.

Bone Mineral Density Evaluation.

All data obtained were entered into a proforma and processed with the Statistical Package for the Social S version 16 (SPSS Inc., Chicago, Illinois). Descriptive statistics were obtained and χ^2 test calculated for categorical data while Mann Whitney U tests were carried out for continuous data. A multivariate logistic regression analysis was carried out using factors found to be significant on initial bivariate analysis. Statist significance was considered at a level of $p \leq 0.05$.

Results

A total of 1005 patients participated in the study. The mean age of the respondents was 41.3±10.0 years w (52.1%) aged below 40 years whilst 481(47.9%) were aged over 40 years. There were 724 (72,0%) femal 281(28.0%) males. None of the patients had deformity of the left hand and wrist. The median length since diagnosis of HIV was 2 years (Range 1- 18 years) and 70.3% were married at the time of the study. The m CD4 count was 371cells/μL (>200 cells/μL in 84.7% and ≤ 200 cells/μL in 15.3%) and the median viral l 200 copies/ml (>400 copies/ml in 49.1% and ≤400 copies/ml in 50.9%) at the time of the study as shown i Table 1. Of the respondents, 785 (78.1%) were on Combination Anti-Retroviral Therapy (CART) and of t number 99 (12.6%) were on protease inhibitors (PI) (Table 1). The mean Body Mass Index (BMI) was 23 9.2% were underweight, 57.7% had normal BMI, 2.1% were overweight whilst 10.0% were obese (Table

Table 1

Characteristics of the study patients, including BMI, CD4 counts and viral load

The Bone Mineral Density (BMD) values revealed osteopenia in 468 (46.6%) of the respondents, osteopc 321 (31.9%) subjects and normal BMD values in 197 (19.6%). Bivariate analyses revealed that the preval osteoporosis in these patients was higher in those aged above 40 years (p=0.00001), higher among the fen gender (p = 0.022), higher in 'single' respondents (p = 0.028) and highest in underweight respondents. Th relative protective effect of obesity is shown in Figure 1. Although the prevalence of osteoporosis was obs to be higher among those on protease inhibitors (38.4%) compared to those on other forms of antiretrovira therapy (33.4 %), this finding was not statistically significant (p = 0.242). Also, although the prevalence o osteoporosis was higher amongst those on CART (33.4%) compared to those on no treatment (26.8%), it reach statistical significance (p = 0.065).

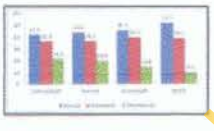

Figure 1:

The effect of BMI on bone mineral density in HIV infection

Using multivariate logistic regression, the odds of having osteoporosis was 6 folds higher among the under 4 folds higher among the normal weight individuals and 2 folds higher among the overweight compared to obese respectively. Other significant factors were female sex (OR 1.96; 95% CI 1.39-2.77) and age > 40 y (OR 2.03; 95% CI 1.51- 2.27).

Discussion

In this study, the prevalence of osteopaenia and osteoporosis were 46.6% and 31.9% respectively, giving a abnormal bone mineral density (BMD) of 80% in the study population. This high level of abnormal BMD been noted in other studies11,12,16-20. The causes of low bone mass in individuals with HIV infection are multifactorial and include the viraemia arising from the HIV infection, CART related factors and tradition osteoporosis risk factors2,8-10. HIV proteins have been shown to cause an increase in osteoclastic activiti well as promote osteoblastic apoptosis both of which lead to reduction in bone mass. The role of treatmen

BMI, time on protease inhibitors, time on tenofovir and current use of protease inhibitors (PI) were associ with demineralization.

Although T scores are often reserved for patients above 50 years and the Z-score reserved for those youn 50 years, in this study, the T-scores were utilized for all the patients since there are no records of populatic based BMD values in our environment. As in other studies, lower BMD values are associated with increas the female sex and underweight. The association of osteoporosis in this study with single status (never ma separated or divorced) is observed and would need further studies.

There are some limitations to this study. The DXA scan machine that was deployed for this study measure BMD at the distal radius. Other studies measured BMD at the lumbar spine, the proximal femur and total Also, other risk factors for low BMD like Vitamin D levels and gonadal hormone levels as well as biomark bone metabolism were not evaluated.

Though the relationship of BMD and fracture is not linear, increasing rates of fractures are being reported amongst patients with HIV infection[13,24,25]. Thus the need to emphasize this problem in our environmen Whilst our findings are similar to the reports from other environments[9,17,19], the results of our study has potential to impact the treatment modalities of these patients in Nigeria. This has become necessary becau PEPFAR/APIN program in Nigeria is undergoing re-organization with increasing transfer of ownership an management to Nigerian Institutions and secondary as well as primary care facilities. In addition, the num orthopaedic surgeons are far too few to cope with the consequences of this large numbers of Nigerians wi potential risk of fracture and other disabilities. As late presentations for most diseases (including HIV infe amongst Nigerians are rampant, the treatment protocols may be skewed when compared to similar cases i developed countries. It has been proposed in the US that a DXA scan should be carried out in HIV-infecte subjects $\geq$ 50 years of age with additional risks for osteopenia/osteoporosis, and pharmacologic treatment initiated in post-menopausal women and men aged $\geq$ 50 years with a T-score of $\leq$ -2.5 in the hip, femoral and spine or those with history of fragility fracture[26,27]. With the peculiarity of our environment and sinc of the patients surveyed in this study had bone demineralization, it may probably not be out of place to recommend the DXA scan for all People living with HIV (PLHIV) attending treatment clinics in Nigeria a commencement of bisphosphonates along with nutritional support for those with low BMI as appropriate on their BMD.

Conclusion

A high prevalence of abnormal bone mineral density was found in HIV positive patients in Nigeria. Patien above 40 years and a body mass index class of underweight were significant associated factors. Routine b mineral density assessment is recommended as an adjunct in the evaluation of HIV positive patients in Nig

Footnotes

Competing Interests: The authors have declared that no competing interests exist.

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