320. UK HOPS (HIV Osteoporosis Prevention and Screening)-Gaps in the Care of HIV Patients with Bone Disease

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Background. With increasing life expectancy among people living with Human Immunodeficiency Virus (HIV), long-term complications such as osteoporosis/osteopenia and fractures are frequently seen. Although screening guidelines exist for bone disease in the HIV population, quantitative and qualitative gaps exist in screening and prevention. Bone disease in HIV is multifactorial, and FRAX may not accurately predict fracture risk. The aim of our study is to describe diagnostic features of bone disease and estimate the population at risk, and evaluate the frequency of screening, referral, and treatment in patients attending an HIV Clinic.

Methods. We performed a retrospective analysis of 1220 patients with HIV infection ≥20 years of age who attended the HIV clinic under the Ryan White program, during January 2016 to December 2018, at University of Kentucky. We obtained demographic details (Table 1), comorbidities, laboratory testing, bone mineral density (BMD) testing and specialty bone clinic referral data from electronic health records, applying ICD-10 and CPT codes. We estimated the frequency of BMD measurement and prevalence of risk factors for bone disease specific to this population.

Results. BMD testing was performed in only 158 (13%) patients (CMS targets 60% for testing at-risk populations). Of these patients, 76 (48%) had osteopenia and 59 (37%) had osteoporosis; 22 (14%) received treatment (Figure 1). Seven patients with osteoporosis/osteopenia and fracture had bone biopsy, with low bone turnover in four (57%). Potential risk factors for secondary osteoporosis are presented in Table 2; at least one factor was present in 98% of patients. Fracture prevalence was likely underestimated because the ICD-10/CPT coding was available only in 23 (2%) patients.

Conclusion. Bone disease is under-recognized and undertreated, and targeted screening programs are needed for earlier diagnosis and management in this population. Bisphosphonates may not be optimal first-line therapy for all HIV patients with bone loss. In addition to stress or fragility fractures and worsening osteoporosis, metabolic bone up-regulation should be performed in patients with secondary osteoporosis related to CKD, renal phosphate loss, prior bisphosphonate/Tenoforiv/glucoctoic treatment.

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321. Low Volumetric Bone Density at Proximal Femur in HIV-Infected Men and Its Risk Factors: Comparison with Community-Dwelling Non-Infected Men

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Background. Individuals with HIV infection is at increased risk of low area bone mineral density (BMD) and fracture. However, data regarding volumetric BMD (vBMD) of central bone determined by quantitative computed tomography (QCT) which can distinguish the cortical and trabecular bone component are limited.

Methods. From November 2017 to October 2018, we measured spine and hip vBMD in HIV-infected men aged 30 years or older at the tertiary center. QCT data were compared with 1:2 matched control by age- and body mass index (BMI) sampled from a community-based healthy individual cohort. HIV-specific risk factors for low total hip vBMD as a primary outcome were identified using multivariate linear regression models.

Results. A total of 83 HIV-infected men and 166 control were analyzed (mean age 47.4 ± 47.0 year; BMI 23.3 ± 23.7 kg/m²; P = 0.05). In HIV-infected men, vBMD of trochanter, intertrochanter and total hip was significantly lower than that of non-infected men. (198 ± 31 vs. 213 ± 32; 339 ± 50 vs. 356 ± 47; 280 ± 41 vs. 296 ± 41 mg/cc; P < 0.05) Association between HIV infection and lower total hip vBMD remained robust (Adjusted β = -14.4; P = 0.003) after adjustment for age, diabetes, smoking, and vitamin D status. In HIV cohort, low CD4 T-cell count at initial diagnosis (< 200 vs. 220 cells/μL; Adjusted β = -6.7, P = 0.015) and use of protease inhibitor (vs. inte- rlipivir; Adjusted β = -2.0; P = 0.029) were negatively associated with total hip vBMD, after adjustment for age, BMI, and duration of HIV infection, whereas tenofo- vir disoproxil fumarate use was not. (Adjusted β = -12.1, P = 0.280) In HIV-infected men with low tertile total hip vBMD, the levels of β-crosslaps (0.42 ± 0.23 vs. 0.30 ± 0.16 ng/mL; P = 0.012) and osteocalcin (22.10 ± 8.65 vs. 16.57 ± 6.92 ng/mL; P = 0.001) were higher than those with middle-upper tertile total hip vBMD.

Conclusion. HIV-infected men had lower hip vBMD compared with age- and BMI-matched non-infected men. Low baseline CD4 T-cell count and protease inhibitor use were independent risk factors for lower total hip vBMD. High born turn-over was attributable to the negative effect on bone health of HIV-infected men.

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322. Prolonged Amenorrhea Is Associated with Decreased Hip Bone Mineral Density in Women Living with HIV

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Background. Women living with HIV (WLWH) have higher rates of long term amenorrhea (no flow for 212 months) than HIV negative women. However, little is known about the consequences of amenorrhea for WLWH. Both amenorrhea and HIV are associated with lower areal bone mineral density (BMD); though the combined effect of both on BMD remains unclear. In this cross-sectional study we investigated whether prolonged amenorrhea adversely affects BMD among WLWH.

Methods. We investigated BMD (using a Hologic bone densitometer) and prol- onged amenorrhea among WLWH and HIV-negative control women of similar sociocoe- nomic backrounds aged 19-68 in the CARMA cohort. Participants were stratified by HIV status and history of prolonged secondary amenorrhea defined as a self-reported absence of menses for at least one year in the past or present, occurring at age ≥45 years and not due to surgery, breastfeeding, pregnancy or hormonal contraception. Hip and spine Z-scores (age- and race- standardized BMD values) were compared between groups using linear models, followed by multivariable analysis of BMD-related factors.

Results. WLWH (N = 129) had significantly lower hip (mean±SD = -0.4 ± 0.9 vs. 0.3 ± 1.1; P = 0.001) and spine (−0.5 ± 1.3 vs. 0.2 ± 1.3; P = 0.001) Z-scores vs. controls (N = 129). Multivariable linear regression found prolonged amenorrhea was independ- ently related to lower hip (P = 0.01), but not spine (P = 0.94) BMD. Within WLWH, the effect of amenorrhea was also additive to that of HIV, with hip Z-scores of -0.8±1.69 for those with amenorrhea vs. -0.3±0.8 for those normally cycling (P = 0.01). Amongst WLWH, those with prolonged amenorrhea had higher rates of illicit substance use, smoking, chronic opiod therapy, hepatitis C viral infection, and poorer HIV viral control.

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Conclusion. These data suggest that WLWH having prolonged amenorrhea of ≥1 year's duration are at increased risk for hip bone loss, a finding influenced by comorbid, HIV-associated conditions. Screening WLWH for menstrual history will allow early discovery of osteoporosis risk, and stimulate preventative measures to mitigate bone loss.

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323. Fragility Fracture Risk in HIV: Awareness Among Primary Care Providers
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Background. Recommendations on screening HIV-infected (+) patients for bone disease exist. We sought to characterize awareness of and adherence to HIV-specific screening recommendations, and assess risk factors for fracture in this population.

Methods. Primary care provider (PCP) and ID specialist awareness of screening recommendations was assessed using an anonymous electronic survey. We conducted interviews of 45 HIV+ patients and chart review. We calculated risk using the fracture risk assessment tool (FRAX). Email notifications were sent if an indication dual-energy x-ray absorptiometry (DXA) scans was identified. Chart review was repeated 12 months later to assess response. Statistical methods included chi-square and Fisher's exact test for categorical data, and t-tests or Wilcoxon rank-sum tests for continuous data. A multivariate logistic regression examined the relationship between adult fragility fractures and covariates.

Results. No immunologic or virologic factors or exposure to specific antiretroviral therapies (ART) were associated with FFX (Table 1). FRAX score (hip, major osteoporotic fracture) successfully predicted FFX history (P = 0.002, P = 0.001, respectively). Overall, 35 (78%) patients qualified for DXA; 23 (66%) were men, only 8 (23%) had a previous DXA. Following provider notification, an additional 5 patients (27%) had a previous DXA. Twenty-seven providers responded to the pre-intervention survey, of whom only 35% were aware of screening recommendations for HIV+ patients. Of the 18 providers who responded, post-intervention, 63% were aware of these recommendations (Table 3).

Conclusion. A brief educational intervention resulted in increased awareness of HIV-specific screening recommendations, but this translated into adherence to a lesser extent. HIV+ men were more likely to have a history of fragility fracture compared with females. No specific ART or immunologic marker predicted fracture risk or history. Fostering a greater understanding of unique characteristics and risks in this population is crucial to ensure appropriate preventive care.

Table 1: Patient characteristics

| Variable                        | Adult Fracture Fracture (n=35) | No Adult Fracture Fracture (n=18) | p-value |
|--------------------------------|---------------------------------|----------------------------------|---------|
| Age (years), mean (SD)          | 58.7 (12.1)                     | 51.3 (13.3)                      | 0.08    |
| Male Gender, n (%)              | 11 (78.6)                       | 17 (54.8)                        | 0.19    |
| Race/Ethnicity, n (%)           | 5 (35.7)                        | 12 (46)                          | 0.36    |
| Hispanic                        | 1 (7.1)                         | 7 (23.2)                         |         |
| Other                           | 9                               | 1 (3.3)                          |         |
| Smoking, n (%)                  | 5 (35.7)                        | 20 (64.5)                        | 0.64    |
| ETG (sub), n (%)                | 3 (21.3)                        | 5 (18.5)                         | 1.0     |
| IV drug use, n (%)              | 2 (14.3)                        | 6 (19.4)                         | 1.0     |
| Diabetes history                | 1 (7.1)                         | 4 (12.5)                         | 1.0     |
| Hispanic C conduction, n (%)    | 8 (56.7)                        | 18 (33.3)                        | 0.11    |
| CD4 nadir, median (IQR)         | 472 (375-725)                   | 449 (311-676)                    | 0.45    |
| Virologic suppression <2 years, n (%) | 11 (78.6) | 21 (72.4) | 1.0 |
| Years initiated, median (SD)    | 12 (10-18)                      | 15 (6-26)                        | 0.62    |
| AIDS defined, n (%)             | 4 (28.6)                        | 4 (12.9)                         | 0.23    |
| Months on ART, median (IQR)     | 30 (29-77)                      | 78 (49-90)                       | 0.05    |
| Protease inhibitor exposure, n (%) | 6 (42.9)                         | 22 (41.9)                        | 1.0     |
| Tenofovir or DF exposure, n (%)  | 11 (64.4)                       | 29 (88.7)                        | 0.94    |
| DEXA Scan Recommended, n (%)    | 14 (100)                        | 21 (87.7)                        | 0.02    |
| FRAX Score (major osteoporotic fractures, mean (SD)) | 11.2 (5.8)   | 5.3 (5.0) | 0.01 |
| FRAX Score (hip fracture, mean (SD)) | 1.9 (1.3)   | 0.8 (0.7) | 0.01 |

Table 2: Logistic Regression analysis

| Odds Ratio (95% Confidence Interval) | p-value |
|-------------------------------------|---------|
| Age                                 | 1.2 (1.0, 1.4) | 0.05 |
| Gender (Male vs Female)             | 0.10 (0.01, 1.1) | 0.06 |
| Months of ART therapy               | 0.94 (0.89, 0.99) | 0.03 |
| Protease inhibitor exposure         | 12.63 (0.76, 210.04) | 0.08 |

Table 3: Pre and post-intervention results of faculty survey to evaluate knowledge of bone health screening recommendations in HIV care.

| Knowledge area                        | Pre-intervention | Post-intervention | Fisher's Exact Test | p-value |
|---------------------------------------|------------------|-------------------|---------------------|---------|
| Privycomenopausal women ≥60           | 4 (15%)          | 6 (35%)           | 0.17                |
| Postmenopausal women                  | 6 (22%)          | 9 (56%)           | 0.11                |
| Women receiving chronic glucocorticoid therapy | 5 (19%) | 6 (44%) | 0.09 |
| Women with history of fragility fracture | 5 (19%) | 9 (56%) | 0.05 |
| Women at high risk for falls          | 2 (7%)           | 7 (39%)           | 0.02                |

Table 3: Pre and post-intervention results of faculty survey to evaluate knowledge of bone health screening recommendations in HIV care.

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324. Outcomes of Immunomodulatory and Biologic Therapy in People Living with HIV: A Report from Two Academic Hospitals
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Background. The use of immunomodulatory drugs (IMDs) is increasingly common. However, data on outcomes of IMD use in people living with HIV (PLWH) are limited and may be biased due to selective reporting of certain outcomes. Institution-level data reflecting patient-time at risk have not been described.

Methods. We systematically identified all PLWH prescribed non-steroidal IMDs from 2012 to 2019 at two centers. We defined a treatment episode (TE) as an uninterrupted period on a particular IMD regimen. Patients contributed multiple TEs if interrupting or switching therapy. We excluded those with lymphoproliferative disorders or transplants. We quantified infections and blips, defined as a detectable viral load following an undetectable result.

Results. 35 patients contributed 55 TEs comprising 24,020 patient-days at risk. 29/35 (83%) were male, median age was 53 (IQR 39–59), median CD4 nadir was 197 (IQR 100–314), and 12/35 (34%) had a prior opportunistic infection. TEs utilized TNF inhibitors (7/55, 35%), PD-1 inhibitors (11/55, 20%), antimetabolites (7/55, 13%), interleukin inhibitors (7/55, 13%), and other agents (7/55, 13%). Preceding plasma HIV RNA was undetectable in 36/55 (65%) TEs. Of these, 18 (50%) were associated with a viral blip within 1 year; one blip was >200 copies and none resulted in sustained viremia. Compared with other agents, PD-1 inhibitors were more likely to result in viral blips, although the clinical significance is unclear.

Conclusions. IMDs can be used without major complications in PLWH on ART, including those not yet suppressed or with CD4 counts < 500. PD-1 inhibitors may be associated with a higher rate of viral blips, although the clinical significance is unclear.

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