

# Evaluation of bone health in older persons with human immunodeficiency virus: are we doing enough?

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## BACKGROUND

- Treatment advancements are leading to a longer life expectancy in persons with human immunodeficiency virus (HIV), which has increased their risk of bone disorders; additional risk factors in persons with HIV (PWH) include HIV itself and select antiretroviral therapy (ART).<sup>1</sup>
  - Tenofovir disoproxil fumarate (TDF) and protease inhibitors (to a lesser extent) have been linked to a decrease in bone mineral density (BMD).<sup>2</sup>
  - TDF is further associated with renal tubulopathy, urine phosphate wasting, and resultant osteomalacia, and should be avoided in osteoporosis (OP).
  - TDF levels are elevated with co-administration of P-glycoprotein inhibitors and further exacerbate the risk to bone disease.<sup>2,3</sup>
- HIV primary care guidelines recommend baseline bone densitometry by dual-energy x-ray absorptiometry (DEXA) for all patients ≥50 years of age.<sup>1</sup>
- There is limited data on the utility of screening tools to identify PWH at risk of bone disease, warranting a DEXA scan and/or further evaluation.
  - Fracture Risk Assessment Tool (FRAX) score has been proposed to estimate the ten-year probability of a fracture and help identify patients with osteopenia.<sup>4</sup>
- Despite recommendations to screen older and at-risk PWH for OP, it remains unclear whether this prevention strategy has been incorporated into clinical practice.

## RESEARCH QUESTION

- How well does a large clinic screen for and treat bone disease in PWH based on risk factors?

## METHODS

- Study Design:** Institutional review board-approved, single-center, retrospective chart review
- Data Collection:** Electronic medical records (EMR) and ICD-10 coding
- Inclusion Criteria**
  - ≥ 40 years of age with diagnosis of HIV infection
  - Receiving care at St. Joseph's University Medical Center Comprehensive Care Center (CCC) from January 1, 2019 to July 31, 2020
- Exclusion Criteria**
  - Patients lost to follow up >1 year
  - Advanced OP therapies that are deferred to oncology
  - ART-naïve patients
- Primary Endpoints**
  - Proportion of patients at risk of OP or fragility fractures with DEXA scan screening performed.
- Secondary Endpoints**
  - Proportion of patients at risk of OP or fragility fractures based on FRAX
  - Proportion of patients with low bone mass and/or fragility fractures
  - Pharmacological management, treatment, and prevention for bone health
  - Management of ART
  - Causes of secondary OP or osteopenia
- Statistical Analyses**
  - Descriptive statistics including percent, mean, and standard deviation
  - Sensitivity and specificity
  - Logistic regressions

## RESULTS

Table 1. Baseline Characteristics (N=733)	
Age (years), mean ± SD	56.0 ± 8.5
Females, n (%)	327 (44.6)
Weight (kg), mean ± SD	81.8 ± 19.4
Low Body Weight*, n (%)	48 (6.5)
Race/Ethnicity, n (%)	
Black or African American	338 (46.1)
Hispanic	324 (44.2)
Caucasian	67 (9.1)
Asian	4 (0.6)
Current Smoker, n (%)	243 (33.2)
Comorbidities / Risk Factors, n (%)	
Hypertension	374 (51.0)
Dyslipidemia	336 (45.8)
Menopause	237 (32.3)
Diabetes	159 (21.7)
Vitamin D Deficiency	92 (12.6)
Osteoporosis	36 (4.9)
Alcohol abuse	29 (4.0)
Fall risk/history of falls	13 (1.8)
Long-term glucocorticoid use	11 (1.5)
Osteopenia	10 (1.4)
Other fractures	5 (0.7)
Hip fracture	3 (0.4)
Rheumatoid Arthritis	2 (0.3)
Years Since HIV Diagnosis, mean ± SD	15.4 ± 8.4
AIDS Diagnosis, n (%)	384 (52.4)
HIV RNA <200 copies/mL, n (%)	662 (90.3%)
CD4 count (cell/mm <sup>3</sup> ), mean ± SD	613.9 ± 306.3
DEXA Scan Screening, n (%)	
T Score <-2.5	6 (20.0)
-2.5 to -1	23 (76.7)
>-1	1 (3.3)

\*less than 127 lbs (57.72 kg)

Figure 1. Proportion of Patients at Risk of OP or Fragility Fractures with DEXA Scan Screening Performed

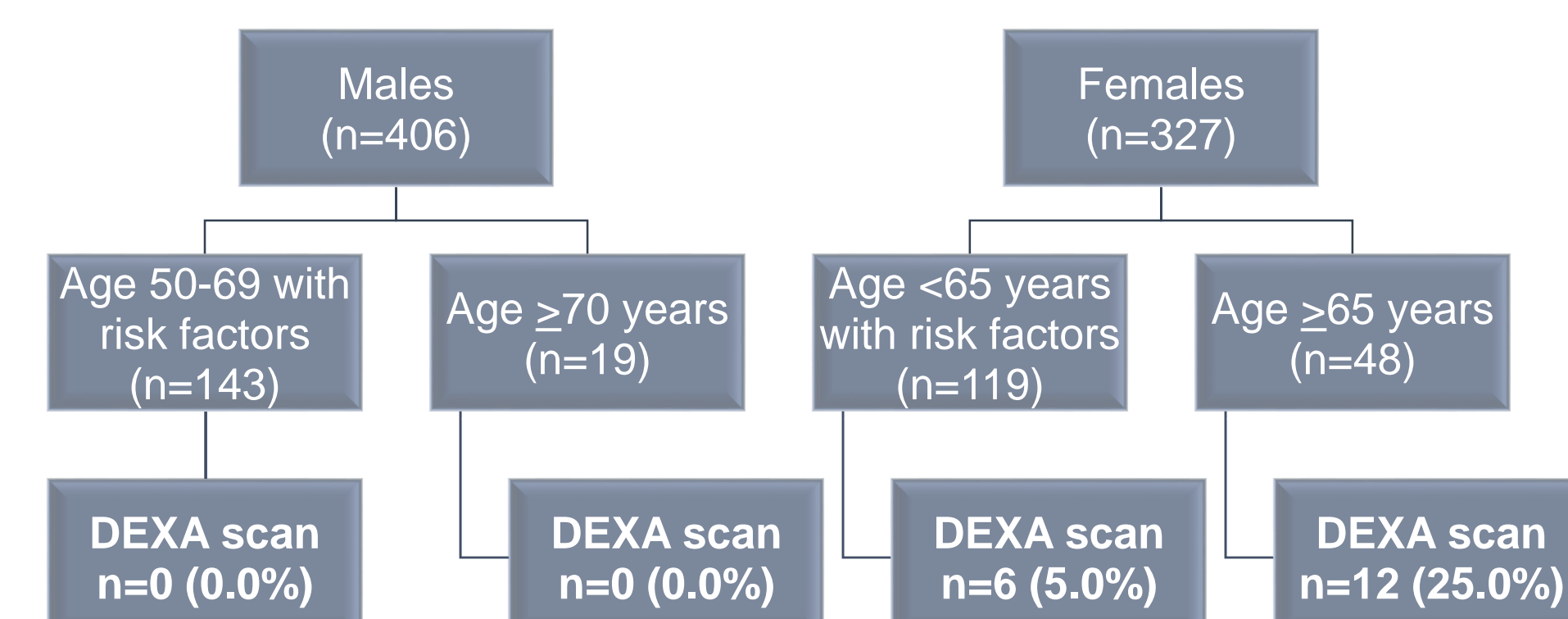


Table 2. Predictors of Obtaining DEXA Scan		
Characteristics	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Race/Ethnicity		
Black	Reference	Reference
Hispanic	1.68 (0.59-4.76)	2.09 (0.67-6.52)
Caucasian	0.72 (0.09-5.94)	1.28 (0.14-11.83)
Insurance	0.50 (0.06-3.88)	0.96 (0.11-8.42)
Current Smoker	0.24 (0.09-0.68)	0.90 (0.25-3.16)
AIDS Diagnosis	0.19 (0.05-0.68)	0.22 (0.06-0.81)*
HIV RNA <200 copies/mL	0.39 (0.05-3.00)	0.47 (0.05-4.18)

\*P=0.02

Table 3. Proportion of Patients at High Risk of OP or Fragility Fractures Based on FRAX score				
	Total patients, n (%)	OP, n (%)	Sensitivity, (95% CI)	Specificity, (95% CI)
Major osteoporotic risk				
Low (<10%)	688 (93.9)	21 (3.1)	2.78 (0.07-14.53)	99.71 (98.97-99.97)
Moderate (10-19%)	42 (5.7)	8 (19.0)		
High (≥20%)	3 (0.4)	1 (33.3)		
Hip fracture risk				
Low-moderate (<3%)	711 (97.0)	25 (3.5)	13.89 (4.67-29.50)	97.56 (96.12-98.57)
High (≥3%)	22 (3.0)	5 (22.7)		

Figure 2. OP Treatment/Prevention Therapy

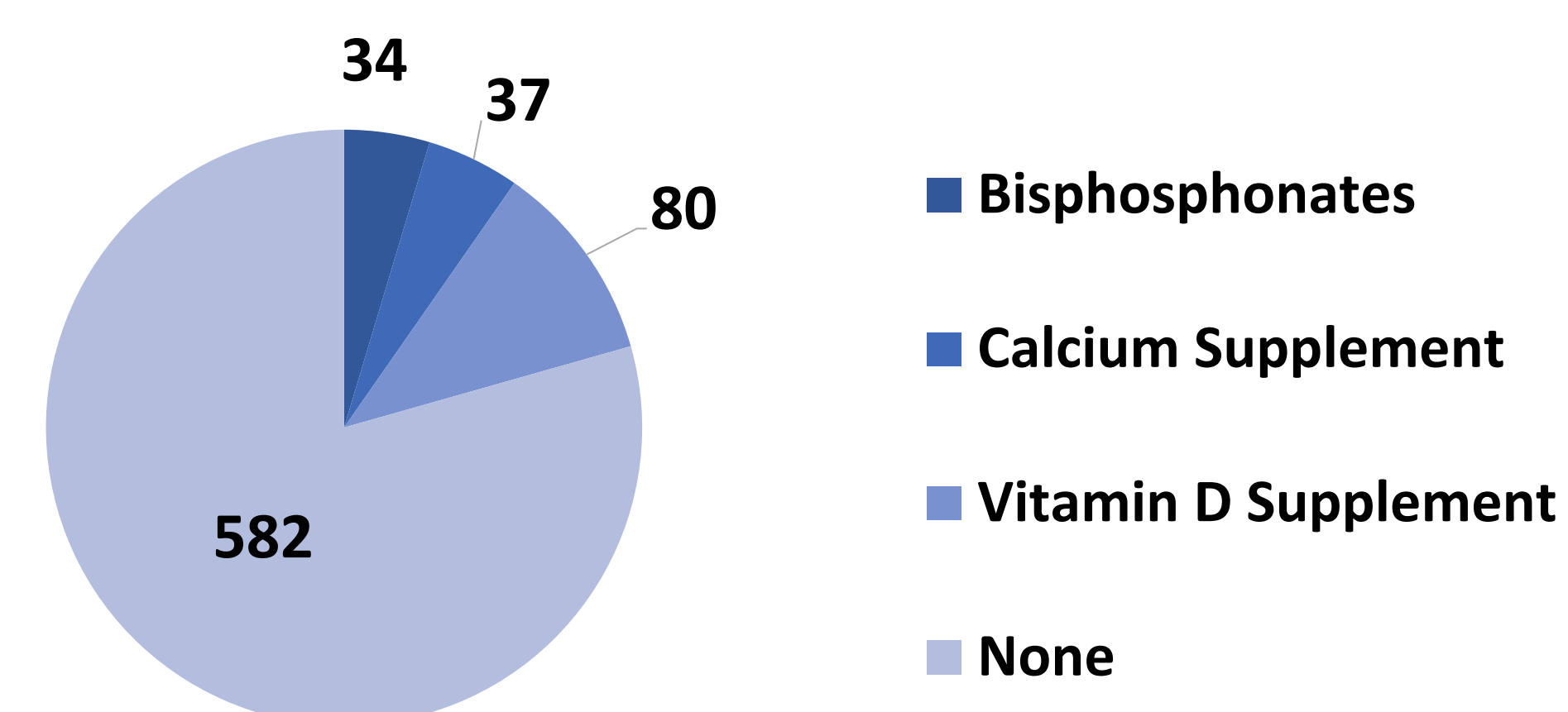


Table 4. Management of ART			
	Total patients, n (%)	OP Diagnosis, n (%)	Osteopenia Diagnosis, n (%)
TAF	536 (73.1)	22 (61.1)	9 (90.0)
TDF	42 (5.7)	2 (5.6)	0 (0.0)
TDF + COBI + RTV	12 (1.6)	0 (0.0)	0 (0.0)

## DISCUSSION

- DEXA scan screening among PWH at our clinic are extremely low
  - Older females were more likely to be screened
  - Patients with an AIDS diagnosis were less likely to get a DEXA scan
  - Other risk factors did not show statistical significance on the ability to receive a DEXA scan
- The FRAX 10-year diagnostic tool is not a sensitive tool for identifying patients that are at a high risk for bone disease.
  - FRAX scores neglect important factors such as risk of falls, 25-hydroxyvitamin D, HIV diagnosis/ART, and bone turnover markers.
- Adequate calcium and vitamin D intake is crucial to develop optimal peak bone mass and is directly related to BMD.
  - Of those with vitamin D levels recorded, 92 out of 132 (69.7%) patients had vitamin D deficiency.
  - Vitamin D deficiency may occur through different mechanisms and further evaluation is required to determine its relation in PWH.
- High percentage of the studied patients with OP and osteopenia were prescribed TAF while a smaller percentage were prescribed TDF.
  - PWH with diagnosed or at high risk of bone disease should avoid TDF due to its association with decrease in BMD.
  - Additional studies need to be conducted to better understand the long-term implications of TAF in this patient population.

## LIMITATIONS

- Paper charts, prior to EMR implementation in 2018, were not reviewed.
- OP treatment and other medications could have been initiated by another provider and not documented in our EMR.
- Family history of osteoporotic fractures was either unavailable or not documented in the EMR which may lead to underestimation of fracture risk.

## CONCLUSION

- BMD screening at our clinic remains markedly low in PWH that are at risk for bone disease.
- Risk factors for bone disease should be routinely evaluated and considered to determine appropriate management in PWH.
- Performance improvement efforts should be initiated to increase DEXA scan screenings and optimize treatment and preventative therapies.

## REFERENCES

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**DISCLOSURE:** Humberto Jimenez is on the Speaker's Bureau for Gilead Sciences, Inc. The other authors have nothing to disclose.

**ABBREVIATIONS:** AIDS: Acquired Immunodeficiency Syndrome; BMI: body mass index; COBI: cobicistat; OR: odds ratio; RTV: ritonavir; SD: standard deviation; TAF: tenofovir alafenamide fumarate