

# Nutritional assessment in the HIV-infected older population receiving antiretroviral therapy

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Supplementary Table 1. Assessments used in the older PLWH by the previous studies

| Author, year                          | Country                  | Study participants                                   | Type of ART use in PLWH                                 | Parameters                                                                                   |                                                                                                                                                                |                                                                        | Outcomes                                                                                                                                             |                    |                    |
|---------------------------------------|--------------------------|------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
|                                       |                          |                                                      |                                                         | Anthropometric                                                                               | Biochemical                                                                                                                                                    | Others                                                                 |                                                                                                                                                      |                    |                    |
| Jones et al., 2008 <sup>57</sup>      | United States of America | 57 HIV (+) vs 47 HIV (–), aged above 55 years        | – 33% on TDF<br>– 52% on PI                             | – BMI<br>– WC<br>– BMD (by DEXA)                                                             | – Vitamin D<br>– Calcium<br>– LH, TSH, FSH, testosterone, estradiol, PTH<br>– Osteocalcin<br>– N– telopeptide                                                  |                                                                        | PLWH had lower levels of BMD than HIV (– ) participants.                                                                                             |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      | HIV (+)            | HIV (–)            |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T– score (hip)                                                                                                                      | –1.18 ± 0.96       | –0.25 ± 1.02       |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T– score (spine)                                                                                                                    | –1.53 ± 1.48       | –0.81 ± 1.25       |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD Z– score (hip)                                                                                                                      | –0.39 ± 0.94       | 0.63 ± 1.07        |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD Z– score (spine)                                                                                                                    | –0.54 ± 1.54       | 0.57 ± 1.27        |
| Erlandson et al., 2013 <sup>60</sup>  | United States of America | 359 PLWH, aged 45–65 years                           | – TDF<br>– PI                                           | – BMI<br>– Whole– body lean mass, Fat mass, BMD, Appendicular skeletal muscle mass (by DEXA) | – Vitamin D<br>– Testosterone<br>– Estrogen<br>– Albumin<br>– Hemoglobin<br>– IGF– 1<br>– IGFBP– 3                                                             |                                                                        | Low physical function                                                                                                                                |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Number                                                                                                                                               | 30                 | 48                 |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> Lean body mass (kg)                                                                                                                     | 46.9 ± 1.7         | 51.6 ± 1.5         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> Fat mass (kg)                                                                                                                           | 21.2 ± 2.0         | 18.3 ± 1.6         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> Appendicular lean mass (kg)                                                                                                             | 20.6 ± 0.9         | 23.7 ± 0.7         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T–score (spine)                                                                                                                     | –1.5 ± 0.2         | –0.7 ± 0.2         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T–score (femoral neck)                                                                                                              | –1.6 ± 0.2         | –1.2 ± 0.1         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T–score (hip)                                                                                                                       | –1.4 ± 0.2         | –0.7 ± 0.1         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> Vitamin D (ng/mL)                                                                                                                       | 25.4 ± 2.3         | 29.5 ± 1.9         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      | HIV (+)            | HIV (– )           |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Rate of osteoporosis                                                                                                                                 | 61%                | 57%                |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Rate of osteopenia                                                                                                                                   | 18%                | 10%                |
| Biver et al., 2014 <sup>5</sup>       | Switzerland              | 28 HIV (+) men vs 112 HIV (– ) men, aged 60–70 years | –82% NRTI<br>–50% NNRTI<br>–64% TDF<br>–33% PI          | –BMI<br>– BMD (by HR– pQCT and DEXA)                                                         | – Vitamin D<br>– Serum creatinine<br>– PTH<br>– Testosterone<br>– Estradiol                                                                                    |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | By HR–pQCT radius,                                                                                                                                   |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Trabecular density (mg HA/cm <sup>3</sup> )                                                                                             | 152 (141-76)       | 172 (150-197)      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Cortical density (mg HA/cm <sup>3</sup> )                                                                                               | 846 (780-888)      | 875 (843-900)      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | By HR–pQCT tibia,                                                                                                                                    |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Trabecular density (mg HA/cm <sup>3</sup> )                                                                                             | 156 (129-194)      | 177 (158-204)      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Cortical density (mg HA/cm <sup>3</sup> )                                                                                               | 827 (787-874)      | 856 (826-888)      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | By DEXA,                                                                                                                                             |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> BMD T–score (spine)                                                                                                                     | –1.43 (–2.26-0.34) | –0.88 (–1.62-0.38) |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> BMD T–score (femoral neck)                                                                                                              | –1.3 (–1.74-0.87)  | –1.18 (–1.66-0.6)  |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> BMD T–score (hip)                                                                                                                       | –0.65 (–1.2-0.34)  | –0.45 (–0.95-0.17) |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      | HIV (+)            | HIV (– )           |
| Muhammad et al., 2019 <sup>62</sup>   | United States of America | 60 PLWH, aged 50 years and above                     |                                                         | – BMI                                                                                        |                                                                                                                                                                | – Dietary patterns (by FFQ, Diet recall, Diet quality, aHEI, MDS, RFS) | Food secure                                                                                                                                          |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Proportion                                                                                                                                           | 45%                | 55%                |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Nutrient intake                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> Fat (g/day)                                                                                                                           | 100.48 ± 42.10     | 83.67 ± 42.58      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> Protein (g/day)                                                                                                                       | 94.10 ± 34.01      | 81.19 ± 31.35      |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> Folate (µg/day)                                                                                                                       | 466.62 ± 157.03    | 370.23 ± 165.08    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> Vitamin E (mg/day)                                                                                                                    | 9.23 ± 5.04        | 6.76 ± 2.84        |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> Copper (mg/day)                                                                                                                       | 1.55 ± 0.69        | 1.15 ± 0.55        |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – 58% overweight                                                                                                                                     |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> BMI (kg/m <sup>2</sup> ): 28.43 ± 7.21                                                                                                |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> aHEI: 46.78 ± 11.73                                                                                                                   |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | – <sup>a</sup> MDS: 4.08 ± 1.70                                                                                                                      |                    |                    |
| Apompong et al., 2020 <sup>27</sup>   | Thailand                 | 349 HIV (+) vs 103 HIV (–), aged above 50 years      | ~~ 55% NNRTI– based regimen<br>~~ 32% PI– based regimen | – MAC, CC (Components of MNA)<br>– BMI<br>– Body fat mass (by BIA)<br>– WHR                  | – TG, HDL– C, LDL– C<br>– Vitamin D<br>– Phosphate, calcium<br>– Glucose<br>– Insulin, TSH<br>– AST, ALT<br>– Serum albumin<br>– hs– CRP<br>– Serum creatinine | – General<br>– Dietary<br>– Subjective (Components of MNA)             | – 18.1% of PLWH had abnormal nutritional status according to MNA<br>– PLWH had lower BMI, lower fat %, and lower fat mass than HIV (–) participants. |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      | HIV (+)            | HIV (–)            |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> BMI (kg/m <sup>2</sup> )                                                                                                                | 23.1 (20.8-25.2)   | 25.3 (22.3-28.7)   |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Fat %                                                                                                                                   | 22.8%              | 26.3%              |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>b</sup> Fat mass (kg)                                                                                                                           | 14.2               | 16.9               |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |
| de Almeida et al., 2020 <sup>59</sup> | Brazil                   | 83 PLWH, aged 50 years or above                      | –                                                       | – BMI<br>– Muscle strength<br>– BMD (by DEXA)                                                | – TG, HDL– C, LDL– C<br>– Hormones<br>– AST, ALT, GGT<br>– Glucose<br>– Serum creatinine<br>– Calcium, phosphorous<br>– CRP                                    |                                                                        | Normal                                                                                                                                               |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      | Presarcopenia      | Sarcopenia         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Proportion                                                                                                                                           | 71.1%              | 16.9%              |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMI (kg/m <sup>2</sup> )                                                                                                                | 27.3 ± 4.0         | 22.9 ± 4.7         |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T–score (spine)                                                                                                                     | –0.95 ± 1.44       | –1.92 ± 1.59       |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD T–score (hip)                                                                                                                       | –0.51 ± 1.12       | –1.37 ± 1.04       |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> BMD                                                                                                                                     | –0.88 ± 1.18       | –1.60 ± 1.42       |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | T–score (femoral neck)                                                                                                                               |                    |                    |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> LMI                                                                                                                                     | 17.6 ± 2.5         | 14.4 ± 1.22        |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | <sup>a</sup> FMI                                                                                                                                     | 16.0 ± 7.5         | 16.8 ± 11.7        |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        | Multiple vertebral morphometric fracture                                                                                                             | 16.7%              | 44.4%              |
|                                       |                          |                                                      |                                                         |                                                                                              |                                                                                                                                                                |                                                                        |                                                                                                                                                      |                    |                    |

<sup>a</sup>:mean value.

<sup>b</sup>:median value.

PLWH: people living with human immunodeficiency virus; TDF: tenofovir; PI: protease inhibitor; BMI: body mass index; WC: waist circumference; BMD: bone mineral density; DEXA: dual energy X-ray absorptiometry;

LH: luteinizing hormone; TSH: thyroid-stimulating hormone; FSH: follicular-stimulating hormone; IGF-1: insulin-like growth factor 1; IGFBP-1: insulin-like growth factor binding protein-1; PTH: parathyroid hormone; NRTI: nucleoside reverse transcriptase inhibitor; NNRTI: non-nucleoside reverse transcriptase inhibitor; HR-pQCT: high-resolution peripheral quantitative computed tomography; FFQ: food frequency questionnaire; aHEI: alternative healthy eating index; MDS: Mediterranean diet score; RFS: recommended food score; MAC: mid-arm circumference; CC: calf circumference; MNA: mini nutritional assessment; WHR: waist-hip ratio; BIA: bioelectrical impedance analysis; TG: triglyceride; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; AST: aspartate aminotransferase; ALT: alanine aminotransferase; hs-CRP: high-sensitivity C-reactive protein; GGT: gamma-glutamyl transferase; LMI: lean mass index; FMI: fat mass index.

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