Prevalence of sarcopenia and associated risk factors among HIV-infected individuals receiving ART

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SARCOPENIA

• “an age-related decrease in muscle mass and function, a precursor for frailty, decreased mobility and premature death”¹⁻⁵

• Operational (diagnostic) definitions⁴⁻⁵:
  • Earlier – muscle mass alone
  • Current – muscle mass, muscle strength and/or physical function

• Sarcopenia – a recent, emerging issue in HIV+⁵

• Reported prevalence
  • In general elderly (Asian), ranges from 4 - 31% (age range, 60-75 years)⁶
  • In HIV+, ranges from 5 – 24% (age range, 54-59 years)⁷⁻⁸

AIMS

1. Determine the prevalence of sarcopenia among treated HIV-infected and compare with demographically matched HIV–uninfected individuals

2. Identify socio-behavioural and clinical factors associated with sarcopenia in HIV+

3. Explore the influence of sarcopenia on health outcomes in the HIV-infected
METHODS: Study population

HIV+ (N=329)*

ID Clinic, UMMC

>25 years old
>12 months cART
<50 copies/L HIV RNA
No acute illnesses
Not pregnant

HIV- (N=290)*

(i)Study advert responders
(ii)Volunteers (hospital staff)
(iii)Accompanying friends of HIV+ patients

>25 years old
No acute illnesses
Not pregnant,
HIV- on rapid screening

*Recruited and completed assessments
METHODS: Study population

HIV+ (N=329)*
- ID Clinic
- >25 years old
- >12 months cART
- <50 copies/L HIV RNA
- No acute illnesses
- Not pregnant

HIV- (N=290)*
- Study advert responders
- (i) Volunteers (hospital staff)
- (ii) Accompanying friends of HIV+
- >25 years old
- No acute illnesses
- Not pregnant, HIV-

Matched by
(i) age
(ii) gender
(iii) ethnicity

HIV+ (n=153)  HIV- (n=153)

*Recruited and completed assessments
METHODS: Data collection

**Questionnaire**
- Physical Activity (IPAQ)
- Quality of life (CASP-12)
- Functional disability (IADL)
- Social isolation (LSNS-6)
- Nutritional status (MNA)
- Depression (DASS-21)

**Physical assessments**
- Anthropometric measurements
- Walking speed (4.5 meters)
- Grip strength (Dynamometer)
- Body composition (BIA)

**Biochemical screening**

*IPAQ - International Physical Activity Questionnaire; CASP-12 - Control, Autonomy, Self-realisation and Pleasure-12 scale; IADL – Instrumental Activities of Daily Living; LSNS-6 – Lubben Social Network Scale-6; MNA – Mini Nutritional Assessment; DASS-21 – Depression, Anxiety, Stress Scale-21.*
## METHODS: Sarcopenia parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Grip strength (GS)</strong></td>
<td>Maximum grip strength&lt;br&gt;Strongest hand (average of 3 attempts)&lt;br&gt;Cut off value: lowest 20\textsuperscript{th} percentile of HIV-</td>
</tr>
<tr>
<td><strong>Walking speed (WS)</strong></td>
<td>Walking time per 4.5 meters&lt;br&gt;Cut off value: slowest 20\textsuperscript{th} percentile of HIV-</td>
</tr>
<tr>
<td><strong>Muscle mass (SMI)</strong></td>
<td>Measured by bioimpedence analysis (BIA) &amp; used validated formula&lt;br&gt;Adjusted to height\textsuperscript{2}</td>
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Adapted from The Asian Working Group for Sarcopenia (AWGS) guidelines - Chen, L.K., et. al. (2014).
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Sarcopenia = low SMI + low (GS / WS / GS & WS)

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<table>
<thead>
<tr>
<th>Demographics</th>
<th>HIV+ Median(IQR) / n(%)</th>
<th>HIV-ve Median(IQR) / n(%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>41 (33 – 51)</td>
<td>41 (33 – 51)</td>
<td>0.731</td>
</tr>
<tr>
<td>Gender</td>
<td>111 (73)</td>
<td>111 (73)</td>
<td>1.000</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>40 (26)</td>
<td>40 (26)</td>
<td>1.000</td>
</tr>
<tr>
<td>Malay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>103 (67)</td>
<td>103 (67)</td>
<td></td>
</tr>
<tr>
<td>Indian</td>
<td>10 (7)</td>
<td>10 (7)</td>
<td></td>
</tr>
<tr>
<td>Socio-behavioural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary or lower</td>
<td>27 (18)</td>
<td>6 (4)</td>
<td>0.001</td>
</tr>
<tr>
<td>Secondary</td>
<td>41 (27)</td>
<td>49 (32)</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>85 (56)</td>
<td>98 (64)</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>123 (81)</td>
<td>123 (81)</td>
<td>0.905</td>
</tr>
<tr>
<td>Body composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>22 (20 – 26)</td>
<td>25 (23 – 28)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI &lt;18.50 (underweight)</td>
<td>18 (12)</td>
<td>8 (5)</td>
<td></td>
</tr>
<tr>
<td>BMI &gt;25.00 (overweight)</td>
<td>41 (27)</td>
<td>70 (46)</td>
<td></td>
</tr>
<tr>
<td>Malnourished</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini nutritional assessment (MNA) scores</td>
<td>8 (5)</td>
<td>2 (1)</td>
<td>0.033</td>
</tr>
</tbody>
</table>
Sarcopenia is more prevalent in middle-aged HIV+ vs. HIV-

- All ages (matched): 10% HIV+ vs. 6% HIV- (p = 0.201)
- Below 50 years (matched): 7% HIV+ vs. 7% HIV- (p = 0.979)
- Above 50 years (matched): 17% HIV+ vs. 4% HIV- (p = 0.049*)
Risk factors associated with sarcopenia in HIV+

Sociobehavioral & Clinical factors

- Age
- Gender (Male)
- Ethnicity (Indian)
- Ethnicity (Chinese)
- GGT
- D-drugs (duration)
- CD4 (baseline)
- BMI
- Employed
- Edu (tertiary)
- Edu (secondary)

Odds ratio

p = 0.008; OR 1.79; 95% CI 1.17 - 2.75
p = 0.906; OR 0.90; 95% CI 0.16 - 4.95
p < 0.001; OR 1.35, 95% CI 0.13 - 14.16
p < 0.001; OR 0.32, 95% CI 0.01 - 0.21
p = 0.005; OR 0.98, 95% CI 0.97 - 1.00
p = 0.004; OR 1.02, 95% CI 1.01 - 1.04
p = 0.028; OR 1.01, 95% CI 1.00 - 1.02
p = 0.037; OR 2.24, 95% CI 1.05 - 4.62
p = 0.006; OR 0.03, 95% CI 0.00 - 0.35
p = 0.038; OR 0.07, 95% CI 0.06 - 0.80
p = 0.038; OR 2.10, 95% CI 0.29 - 15.42
Functional disability & mortality risks are associated with sarcopenia

Health outcomes

- Falls: p = 0.842; OR 1.22, 95% CI 0.35 - 3.62
- Functional disability: p = 0.004; OR 3.95, 95% CI 1.57 - 9.97
- Healthcare utilization: p = 0.435; Coeff -0.81, 95% CI -2.84 - 1.23
- QOL: p = 0.126; Coeff -1.83, 95% CI -4.19 - 0.52
- Mortality risk: p = 0.007; Coeff 5.42, 95% CI 1.46 - 9.37
Conclusions

Sarcopenia is more prevalent in middle-aged HIV-infected compared to demographically matched HIV-uninfected individuals

Risk factors associated with sarcopenia in the HIV-infected include education, employment, BMI, baseline CD4, exposure to D-drugs & GGT levels

Sarcopenia was significantly associated with functional disability & mortality risks in the HIV-infected
Limitations

Cross-sectional design limits finding causality for risk factor associations.

One healthcare center involvement prevents generalization of findings to HIV patients outside the current setting.

Further analysis to explore the association between sarcopenia and frailty and its impact on health outcomes.
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