What's “Normal?” Considerations in Establishing the Appendicular Lean Mass DXA Reference Population

Category: Aging, Arthritis and Muscle/Bone Interactions

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Sarcopenia definitions include appendicular lean mass (ALM) measurement with “low” defined as 2 SD below the young adult mean. However, population body composition continues to change over time, thereby complicating the reference standard to which DXA measurements are compared. Given this variation in “normal”, a potential alternative approach is comparison with people similar to ancestral hunter-gathers in activity as a physiologic “normal.” Young athletes may represent such a population. This work compares athletes’ body composition parameters with NHANES young adults and explores sarcopenia prevalence using cutpoints derived from differing reference populations.

Methods: Total body DXA measurements (Lunar iDXA) were obtained in college athletes. NHANES (1999–2004) DXA body composition data (Hologic) were downloaded from the NHANES website; 20-29 year olds were used for comparison. ALM was calculated based on lean mass excluding bone values. Athlete and NHANES BMI, ALM/ht², peripheral % fat and leg fat/lean ratio were compared by t-test using JMP (SAS, Cary, NC).

Results: The mean (range) age and BMI of 313 athletes (163M/150F) and 2116 NHANES (1117M/999F) participants was 20.0 (18-24) vs. 24.3 (20-29) years and 24.5 (18.1-36) vs. 25.9 (14.4-65.0) kg/m² respectively. Athletes had lower BMI, higher ALM/height² ratios (8.58 vs. 7.85 kg/m²), lower % peripheral fat (20.5 vs. 32.4%) and leg fat/lean mass ratios (0.30 vs. 0.58, all p≤0.0001). This was also true when separated by gender (all p≤0.0001). “Low” ALM/ht² cutpoints (2 SD below young mean) differed using the athletes, NHANES and commonly utilized values (Table). Applying these cutpoints to 70-85 year old individuals in NHANES 1999-2004, sarcopenia prevalence ranged from 4% (NHANES as reference) to 32% (athletes as reference).

In conclusion, there is great variation in potential “normal” body composition data depending on the reference population used. Applying ALM/ht² cutpoints using different reference datasets results in large differences in sarcopenia prevalence; similarly, measures of body fat vary dramatically. Simplicitic use of a “normal” population, (e.g., NHANES) as a reference dataset, as has been done for BMD, may not be appropriate. An alternative approach using “optimal” or “ancestral” body composition might better predict outcomes such as falls, mobility and/or fracture.

Disclosures: None

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**ATTACHMENTS**

Values to define low ALM/ht² (kg/m²) using different reference data:

<table>
<thead>
<tr>
<th>Reference population</th>
<th>Male</th>
<th>Female</th>
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</thead>
<tbody>
<tr>
<td>Athlete</td>
<td>7.51</td>
<td>5.83</td>
</tr>
<tr>
<td>NHANES</td>
<td>5.76</td>
<td>4.24</td>
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<tr>
<td>Baumgartner</td>
<td>7.26</td>
<td>5.45</td>
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