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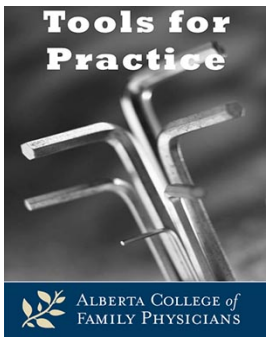

The skinny on BMI and mortality

Clinical Question: What is the association between body mass index (BMI) and mortality?

Bottom-Line: Normal (20-25) to overweight (25-30) BMI carry the lowest risk of mortality, with ~25 appearing lowest (in elderly ~27.5). Mortality increases when BMI is below "low-normal" (BMI <20) and obese (BMI ≥30), more at the extremes.

Evidence:

- ≥8 systematic reviews of observational studies in general population evaluating all-cause mortality at various BMI ranges.[1-10] Focusing on the largest and most recent:
  - Most studies[1] (97 studies, 2.88 million participants) compared to normal (BMI 18.5-24.9), relative risks (RR):
    - Overweight (BMI 25-29.9): RR=0.94.
    - Obese Grade I (BMI 30-35): RR=0.95.
    - Obese Grade ≥II (BMI >35): RR=1.29.
  - Most participants[2] (eight studies, 5.8 million participants) comparing to high normal BMI (22.5-25), hazard ratios (HR) for men:
    - Low (BMI <18.5): HR=1.88.
    - Low normal (BMI 18.5-20): HR=1.39.
    - Mid normal (BMI 20-22.5): HR=1.15.
    - High normal (BMI 22.5-25): HR=1.00.
    - Low overweight (BMI 25-27.5): HR=0.97.
    - High overweight (BMI 27.5-30): HR=1.04.
    - Obesity Grade I (BMI 30-35): HR=1.18.
  - Third largest[3] (19 studies, 1.46 million participants) compared to BMI 22.5-24.9 for women:
    - BMI <18.5-20: Increase mortality (HR=1.25).
    - BMI 20-27.4: Very similar risk throughout range (HR=1.03-1.05).
    - BMI >27.5: Mortality increases with BMI, examples:
      - BMI 27.5-30: HR=1.14.
      - BMI 40-50: HR=2.13.
  - Others found similar.[4-8]
  - Meta-analysis in specific populations:

- Diabetes:[9] Similar to above.
- Elderly (age ≥65):[1,10,11] Overweight lower risk (best ~27.5 BMI).[10]
- Pre-existing CVD,[12-15] COPD,[16] hemodialysis:[17] Overweight and Grade I obesity similar risk[12] or reduced risk[13-17] relative to normal weight BMI.

Context:

- Confidence intervals not presented above: Trends of risk are more informative. Highest risk occurs at extremes of BMI with lowest risk occurring around 25 (27.5 in elderly). Minimal differences in HR/RR around 1 (e.g. 0.9-1.1) are likely of little clinical importance.
- Observational studies cannot prove causation.
- BMI indicates weight for height: Weight (in kilograms) divided by height (in metres) squared. BMI does not indicate fitness level.[18]
- Guidelines recommend the use of BMI as an assessment for obesity and intervention in individuals who are overweight and obese.[19,20]

Authors:
Braiden Hellec BSc Pharm, G Michael Allan MD CCFP

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