

Citation:

Mazza A, Zamboni S, Tikhonoff V, Schiavon L, Pessina AC, Casiglia E. Body mass index and mortality in elderly men and women from general population. The experience of Cardiovascular Study in the Elderly (CASTEL). *Gerontology*. 2007;53(1):36-45.

PubMed ID: [16983188](#)

Study Design:

Prospective Cohort Study

Class:

B - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To investigate the role of body mass index (BMI) as a predictor of mortality in elderly subjects aged 65 years and older.

Inclusion Criteria:

- ≥ 65 years of age

Exclusion Criteria:

- Urine infection
- Other exclusions not specified

Description of Study Protocol:

Recruitment: subjects were part of the Cardiovascular Study in the ELderly (CASTEL), recruited from two towns in Northern Italy, and representing 73% of the elderly subjects ≥ 65 years of age

Design: Prospective cohort study

Blinding used (if applicable): electrocardiogram was analyzed by an expert who did not know the aim of the study; other blinding not indicated

Intervention (if applicable): not applicable

Statistical Analysis

- Association of BMI with mortality was investigated using BMI as both a continuous and a categorical variable:

- continuous analysis: multivariate stepwise proportional hazard Cox regression to identify variables having a prognostic role on mortality
 - proportionality assumption previously tested by adding a time-dependent covariate for each variable
 - gender was accepted in the Cox models, so analysis was performed separately in each gender
- categorical analysis: participants grouped according to gender-specific quintiles of BMI distribution; Hazard ratio (HR) and 95% confidence interval (95% CI) was calculated
 - analysis was repeated after excluding subjects who were current and former smokers and those who died in the first 2 years after the initial screening (pre-existing chronic disease)

Data Collection Summary:

Timing of Measurements

- Initial screening and annual follow-up for mortality for 12 years

Dependent Variables

- Mortality: determined from Registry office and double-checked for causes of death by referring to hospitals, retirement homes or physicians' files

Independent Variables

- Body mass index (BMI) (kg/m^2): calculated from measured height and weight
 - weight: measured with subjects wearing minimal clothing
 - height: obtained without shoes

Control Variables

- COPD: forced expiratory volume in 1 s < 70% of individual theoretical value, history of chronic cough, morning catarrh, X-ray emphysema or asthma
- Hypertension: systolic BP ≥ 140 mm Hg or diastolic BP ≥ 90 mm Hg; BP measured by sphygmomanometric supine BP
- Diabetes: taking antidiabetic drugs or having fasting blood glucose level ≥ 70 mM
- Smoking: current (≥ 1 cigarette daily), never or former smokers (having ceased at least one year prior to screening)
- Alcohol consumption: drinkers (≥ 15 ml daily) and non-drinkers
- Albuminuria
- Proteinuria >200 mg/l
- Hyperuricemia: serum uric acid >0.35 mM
- Positive myocardial scintigraphy, positive stress test, history of myocardial infarction, angina pectoris, left ventricular hypertrophy, atrial fibrillation as determined from electrocardiogram and/or physician records

Description of Actual Data Sample:

Initial N: N= 3,292 (males: N=1,281; females: N=2,001)

Attrition (final N): not specified

Age:

at baseline: 73.8±5.3 years (range: 65-95)

- males: 73.1±4.8
- females: 74.2±5.5
- P<0.0001

Ethnicity: not specified

Other relevant demographics: none specified

Anthropometrics

BMI:

- males: 25.8±4.6 kg/m²
- females: 26.7±4.6 kg/m²
- P<0.0001
- all quintiles of BMI: P<0.00001 versus each other in both genders

Location: Northern Italy

Summary of Results:

Key Findings

- In Cox analysis, male gender significantly predicted overall (HR=1.93, 95%CI: 1.23-3.0), coronary (HR=1.33, 95% CI: 1.19-1.49) and cancer mortality (HR=1.58, 95%CI: 1.35-1.85).
- In men:
 - BMI inversely and independently predicted overall ($\beta = -0.02$, P=0.0001) and cancer mortality ($\beta = -0.04$, P=0.008)
 - Overall mortality was predicted by age (+10% for every year, P<0.0001), diabetes (HR=1.27, 95% CI: 1.16-1.36), left ventricular hypertrophy (HR=1.35, 95%CI: 1.10-1.74) and BMI as a continuous item ($\beta = -0.05$, P=0.0001). The model was not changed by including markers of illness (history of CHD and COPD, atrial fibrillation, cigarette smoking and hyperuricemia)
 - The relationship between BMI and overall mortality was inverse (Q1 versus Q5 (reference): 64.7% versus 52.5%, respectively; the independent and inverse relationship remained significant after excluding current and former smokers, and those who died in 2 years after the initial screening, and after adjusted for age.
 - No predictive effect of BMI on overall mortality risk was observed after 76 years of age.
 - Overall mortality was double in men in the lower BMI quintile when both low cholesterol and high alcohol consumption were present (HR=1.94, 95%CI: 1.23-2.96).
 - There was an inverse relationship between BMI and cancer mortality risk ($\beta = -0.003$, P=0.01) (Q1 versus Q5 (reference): 23.1% versus 13.4%, respectively)
- In women:
 - no relationship found between BMI and overall mortality, or coronary, stroke or cancer mortality.

Author Conclusion:

BMI was inversely related to survival in elderly men aged 65-76 years and independently predicted overall and cancer mortality. Elderly men with BMI under 22.7 kg/m² are at the greatest risk. A BMI over 29 kg/m² appears to play a protective role on survival. No relationship can be found between BMI and mortality in elderly women.

Reviewer Comments:

Inclusion/exclusion criteria not well described. Cohort not well described. Attrition not specified. Authors note a possible limitation of the present study is lack of adjustment for pre-existing cancer and weight loss changes in the years preceding the initial screening.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

- | | | |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | N/A |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies) | N/A |

Validity Questions

- | | | |
|------|---|-----|
| 1. | Was the research question clearly stated? | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated? | Yes |
| 1.3. | Were the target population and setting specified? | Yes |
| 2. | Was the selection of study subjects/patients free from bias? | No |

2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	No
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	Were study groups comparable?	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	Was blinding used to prevent introduction of bias?	Yes

5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes

7.7.	Were the measurements conducted consistently across groups?	Yes
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

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