

Citation:

Levitan EB, Mittleman MA, Håkansson N, Wolk A. Dietary glycemic index, dietary glycemic load and cardiovascular disease in middle-aged and older Swedish men. *Am J Clin Nutr.* 2007 Jun; 85 (6): 1,521-1,526.

PubMed ID: [17556687](#)

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 test the hypothesis that men consuming diets high in glycemic index or glycemic load have a greater risk for cardiovascular disease.

Inclusion Criteria:

- Swedish men living in Vastmanland and Orebro Counties
- Aged 45-79 years.

Exclusion Criteria:

- Men who provided incorrect national identification numbers or who did not provide national identification numbers (N=260)
- Men who returned blank questionnaires (N=92)
- Men who had a previous diagnosis of cancer except nonmelanoma skin cancer (N=2,592)
- Participants with a history of cardiovascular disease before January 1, 1998, determined from record linkage to the Swedish Inpatient register or a history of diabetes determined from record linkage and self-report (N=5,069)
- Participants who did not report their height and weight or who reported implausible energy intakes (N=4,591).

Description of Study Protocol:**Recruitment**

- The Cohort of Swedish Men, a prospective study of men living in Vastmanland and Orebro Counties in central Sweden, was established in 1997 and 1998
- The Swedish population register was used to identify all men aged 45-79 years living in the

two counties

- All men were mailed a four-page questionnaire.

Design

Prospective cohort study.

Dietary Intake/Dietary Assessment Methodology

- Dietary glycemic index and glycemic load assessed through 96-item food-frequency questionnaires (FFQ)
- Nutrient values calculated with food composition data from the Swedish National Food Administration
- Database of glycemic index and glycemic load values with white bread as the reference food was created on the basis of primarily the international glycemic index and glycemic load tables.

Blinding Used

Not applicable.

Intervention

Not applicable.

Statistical Analysis

- Trends across quartiles of dietary glycemic index and glycemic load were tested by using the median in each quartile as a predictor in linear models for continuous variables and in logistic models for categorical variables
- Cox proportional hazard models were used with age as the time scale to estimate relative risks (RR)
- Tests of linear trend were performed by entering the median of each quartile as a predictor into the models
- Deviations from the proportional hazards assumption was tested by entering interaction terms between the dietary glycemic index, dietary glycemic load and the natural logarithm of time in the models
- Stratified analysis and tests for interaction by BMI and waist-to-hip ratio were conducted.

Data Collection Summary:

Timing of Measurements

- Dietary glycemic index and glycemic load were assessed at baseline
- Patients were followed from January 1, 1998 to December 31, 2003 for all cardiovascular disease-related outcomes and to December 31, 2005 for all-cause mortality.

Dependent Variables

- Myocardial infarction
- Schemic stroke
- Hemorrhagic stroke
- Cardiovascular mortality and all-cause mortality assessed through inpatient, cause-of-death and death registries.

Independent Variables

- Dietary glycemic index and glycemic load assessed through 96-item FFQs
- Nutrient values calculated with food composition data from the Swedish National Food Administration
- Database of glycemic index and glycemic load values with white bread as the reference food was created on the basis of primarily the international glycemic index and glycemic load tables.

Control Variables

- Cigarette smoking
- Physical activity
- Demographic characteristics
- BMI and waist-to-hip ratio calculated from self-reported anthropometric data
- Self-reported history of hypertension
- Family history of myocardial infarction before age 60
- Use of aspirin
- Marital status
- Education
- Quartiles of intake of total energy, carbohydrate, saturated fat, polyunsaturated fat, protein, alcohol and cereal fiber.

Description of Actual Data Sample:

- *Initial N*: 48,850 men responded to mailed questionnaire
- *Attrition (final N)*: 36,246 men after exclusion criteria applied
- *Age*: 45-79 years at baseline
- *Ethnicity*: Not mentioned
- *Other relevant demographics*: None
- *Anthropometrics*: None
- *Location*: Sweden.

Summary of Results:

Key Findings

- During six years of follow-up, dietary glycemic index and dietary glycemic load were not associated with myocardial infarction (N=1,324), ischemic stroke (N=692), cardiovascular mortality (N=785) or all-cause mortality (N=2,959 after eight years)
- Men with a higher dietary glycemic load tended to be somewhat more physically active and less likely to be current smokers than men with lower dietary glycemic load. They also consumed less fat, protein and alcohol, and more carbohydrate
- Both dietary glycemic index and glycemic load were positively correlated with cereal fiber ($r=0.19$ and 0.37 , respectively)
- Dietary glycemic load was associated with hemorrhagic stroke [N=165, relative risk=1.44 comparing extreme quartiles (95% confidence interval: 0.91-2.27), P for trend=0.047]
- There was a significant interaction between dietary glycemic load and cereal fiber intake on all-cause mortality (P=0.02).

Author Conclusion:

- In summary, dietary glycemic index and glycemic load were not associated with ischemic cardiovascular disease or mortality in this population, but dietary glycemic load was associated with an increased risk of hemorrhagic stroke
- Discrepancies between these findings and previous studies may be due to variations in the associations by sex or differences in dietary contribution to glycemic index and glycemic load.

Reviewer Comments:

- *Large sample size*
- *Dietary assessment occurred only at baseline in 1997/1998, outcomes measured six to eight years later*
- *Anthropometric data based on self-report.*

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? | Yes |

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?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
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)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
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?	N/A

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.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
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?	N/A
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?	N/A
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