

**Citation:**

Grant R, Bilgin A, Zeuschner C, Guy T, Pearce R, Hokin B, Ashton J. The relative impact of a vegetable-rich diet on key markers of health in a cohort of Australian adolescents. *Asia Pac J Clin Nutr.* 2008;17(1):107-15.

**PubMed ID:** [18364335](#)

**Study Design:**

Cross-Sectional Analysis of a Cohort

**Class:**

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

**Research Design and Implementation Rating:**

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To investigate possible relationships between nutrition and lifestyle behaviors and selected markers of health in 14-15 year old children.

**Inclusion Criteria:**

- Participants were recruited from five Adventist secondary schools in the Sydney and Hunter regions of New South Wales, Australia.
- Participants were at least 14 years of age and had not turned 16 years of age by the date of the study.

**Exclusion Criteria:**

- Participants were not actively excluded from participating in the study.
- Data regarding medical conditions and medications were recorded on the survey and used to exclude participants at the time of data analysis, if necessary, to reduce possible confounding factors.

**Description of Study Protocol:**

**Recruitment:** Participants were recruited from five Adventist secondary schools in the Sydney and Hunter regions of New South Wales, Australia. This demographic was chosen because it was more likely to include a greater number of participants with a predominantly vegetarian diet.

**Design:** A cross-sectional analysis of a cohort.

**Blinding used (if applicable):** The use of blinding was not reported.

**Intervention (if applicable):** No intervention was applied in this cross-sectional analysis.

**Statistical Analysis:**

- The Statistical Package for Social Sciences (SPSS) was used for analysis.
- One-way and two-way analysis of variance was used to investigate the main effects of individual factors and the interactions between the factors on a single outcome variable.
- Bonferroni adjustments were made for multiple pairwise comparisons.
- Student's t-test was performed to determine significant differences when there was only one independent variable (risk factors).

**Data Collection Summary:**

**Timing of Measurements:**

- Following an overnight fast, a 5-10 mL blood sample was drawn from each subject and analyzed for total cholesterol, low density lipoprotein cholesterol (LDL), high density lipoprotein cholesterol (HDL), triglycerides, glucose, homocysteine, vitamin B12, folate and hemoglobin.
- Participants self-completed a modified version of Booth et al's New South Wales Schools Physical Activity and Nutrition Survey (SPANS) following instruction.

**Dependent Variables:**

- Height
- Weight
- Waist circumference
- Body mass index (BMI)
- Blood concentrations for vitamin B12, triglycerides, homocysteine, hemoglobin, glucose, folate, HDL cholesterol, LDL cholesterol
- Systolic and diastolic blood pressures

**Independent Variables:**

- Gender
- Non-vegetarian or vegetable rich diet
- Soft drink consumption
- Breakfast frequency
- Fish, nut and dairy consumption
- Summer sports intensity

**Control Variables:** None reported

**Description of Actual Data Sample:**

**Initial N:** 215 participants were recruited

**Attrition (final N):** 8 surveys had missing data for one or more of the variables required for analysis. A total of 207 complete observations (124 girls and 83 boys) were used for analysis requiring all variables.

**Age:** All participants were at least 14 years of age and had not turned 16 years of age by the date of the study.

**Ethnicity:** A breakdown of ethnicity was not reported. All of the study subjects were enrolled in secondary school in the Sydney and Hunter regions of New South Wales, Australia.

**Other relevant demographics:** None

**Anthropometrics:** Differences observed between the non-vegetarian and the vegetarian groups are reported in the summary of results. No baseline difference was observed in average height.

**Location:** Five Adventist secondary schools in the Sydney and Hunter regions of New South Wales, Australia.

## Summary of Results:

### Key Findings:

- Participants following a vegetarian diet had significantly lower serum vitamin B12 ( $p < 0.001$ ), total cholesterol/HDL cholesterol ratio ( $p < 0.01$ ), LDL cholesterol ( $p < 0.01$ ), waist circumference ( $p < 0.01$ ), body weight ( $p < 0.01$ ) and BMI ( $p < 0.05$ ) when compared to non-vegetarians.
- Nut consumption of 1-3 times per week or more was associated with significant differences in both BMI ( $p < 0.01$ ) and blood glucose ( $p < 0.05$ ) independent of vegetarian status.
- Eating breakfast more than 3 times per week was positively associated with higher average vitamin B12 ( $p < 0.01$ ) and folate ( $p < 0.001$ ) concentrations and lower blood homocysteine levels ( $p < 0.001$ ).
- No significant associations were observed between sports intensity categories and any of the key markers of health evaluated in the study.

## Author Conclusion:

- Adolescents consuming predominantly vegetarian foods showed significantly better scores on markers of cardiovascular health, including, body mass index (BMI), waist circumference, cholesterol/HDL ratio and LDL.
- Adolescents consuming nuts more than once per week also showed lower scores for BMI and serum glucose irrespective of their vegetarian status.
- Surprisingly, exercise on its own was not statistically associated with any of the risk factors tested suggesting that diet may be the most significant factor in promoting health in this age group.
- In light of the current trend toward an overall increasing risk of CVD in children, this study supports the view that a balanced predominantly vegetarian diet may be an effective adjunct strategy for combating lifestyle diseases in children.

## Reviewer Comments:

- *The authors classified participants as vegetarian (i.e. having a vegetable-rich diet) if they consumed red meat less than once per week, chicken less than once per week and fish less*

than once per week.

- None of the participants in this study reported a vegan diet. All of the participants classified as vegetarian followed a lacto-ovo vegetarian diet.
- The authors did not find a significant association between exercise frequency and intensity and any of the risk factors studied. The authors noted that this could suggest that diet may be the most significant factor in promoting health in this age group. There was concern noted that in an adolescent cohort the biochemical markers tested tend to be closer to their homeostatic set point suggesting that larger numbers are needed to provide the required sensitivity. The authors also chose to only analyze participation in summer activities (as this was the time of year the survey took place). Given the tendency of this population to participate in organized activities that take place cyclically throughout the calendar year, physical fitness level may not have been fully assessed.
- It is difficult to extrapolate the result of this study to the broad population of adolescents in Australia (or the world) because the participants of this study were a convenience sample taken from Seventh-Day Adventist secondary schools in a small area of Australia. The sample was chosen because of the prevalence of vegetarian diets in the Adventist community.

### 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) | Yes |
| 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)  | Yes |

#### Validity Questions

- |      |   |     |
|------|---|-----|
| 1.   | <b>Was the research question clearly stated?</b>  | 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.   | <b>Was the selection of study subjects/patients free from bias?</b>                           | 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?	Yes
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
<b>3.</b>	<b>Were study groups comparable?</b>	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.)	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.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	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?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	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
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	<b>Yes</b>
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
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>Yes</b>
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?	N/A
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
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	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?	No
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

Copyright American Dietetic Association (ADA).