RESEARCH
Review

A Systematic Review and Meta-Analysis of Changes in Body Weight in Clinical Trials of Vegetarian Diets

Neal D. Barnard, MD; Susan M. Levin, MS, RD, CSSD; Yoko Yokoyama, PhD, MPH

ARTICLE INFORMATION

Article history:
Accepted 19 November 2014

Keywords:
Dietary intervention
Overweight
Plant based
Vegan
Vegetarian

2212-2672/Copyright © 2015 by the Academy of Nutrition and Dietetics.
http://dx.doi.org/10.1016/j.jand.2014.11.016

ABSTRACT

In observational studies, vegetarians generally have lower body weights compared with omnivores. However, weight changes that occur when vegetarian diets are prescribed have not been well quantified. We estimated the effect on body weight when vegetarian diets are prescribed. We searched PubMed, EMBASE, and the Cochrane Central Register of Controlled Trials for articles through December 31, 2013. Additional articles were identified from reference lists. We included intervention trials in which participants were adults, interventions included vegetarian diets of ≥4 weeks' duration without energy intake limitations, and effects on body weight were reported. Two investigators independently extracted data using predetermined fields. Estimates of body weight change, comparing intervention groups to untreated control groups, were derived using a random effects model to estimate the weighted mean difference. To quantify effects on body weight of baseline weight, sex, age, study duration, study goals, type of diet, and study authorship, additional analyses examined within-group changes for all studies reporting variance data. We identified 15 trials (17 intervention groups), of which 4 included untreated controls. Prescription of vegetarian diets was associated with a mean weight change of −3.4 kg (95% CI −4.4 to −2.4; $P<0.001$) in an intention-to-treat analysis and −4.6 kg (95% CI −5.4 to −3.8; $P<0.001$) in a completer analysis (omitting missing post-intervention values). Greater weight loss was reported in studies with higher baseline weights, smaller proportions of female participants, older participants, or longer durations, and in studies in which weight loss was a goal. Using baseline data for missing values, I^2 equaled 52.3 ($P=0.10$), indicating moderate heterogeneity. When missing data were omitted, I^2 equaled 0 ($P=0.65$), indicating low heterogeneity. Studies are relatively few, with variable quality. The prescription of vegetarian diets reduces mean body weight, suggesting potential value for prevention and management of weight-related conditions.
J Acad Nutr Diet. 2015;■:■-■.

EXCESS BODY WEIGHT HAS BECOME A WORLDWIDE problem. More than 1.4 billion adults, aged 20 and older, are overweight[1] and at increased risk of diabetes, cardiovascular disease, hypertension, osteoarthritis, and certain forms of cancer, and at increased mortality risk after breast cancer diagnosis.[2]

In observational studies, people who follow plant-based diets typically have lower body weights compared with individuals following other dietary patterns,[3] suggesting that such diets may be useful for preventing or treating weight problems. However, observational studies of individuals following self-selected diets over long periods may not provide an accurate estimate for the weight changes that occur when a diet is prescribed. In addition, some studies using plant-based diets have included exercise[4] or have controlled energy intake, to either promote or prevent weight loss,[5] confounding an assessment of the effects of diet on body weight. Studies comparing different weight-loss diets also fail to address this question. Although such studies are appropriate for comparing the effects of one diet relative to another, they do not quantify the absolute weight changes to be expected when a specific diet is prescribed, compared with not prescribing a diet at all.

We therefore sought to identify the body of data from clinical trials using vegetarian (including vegan) diets as interventions and to quantify the weight loss resulting from the prescription of these diets in adults, independent of the confounding effects of exercise or caloric limits. We hypothesized that evidence from clinical trials would indicate that the introduction of vegetarian diets leads to weight reductions in both overweight and normal-weight individuals, compared with untreated control groups.

METHODS

The study was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[6] The protocol was registered on

© 2015 by the Academy of Nutrition and Dietetics.

PROSPERO (http://www.crd.york.ac.uk/prospero/search.asp) on December 19, 2012, registration number CRD42012003506.

Eligibility Criteria

We searched the published scientific literature for full articles or abstracts reporting results of clinical trials in adult humans in which vegetarian (defined as excluding meat, poultry, and fish) or vegan (defined as excluding animal-derived food products) diets were used as interventions of at least 4 weeks' duration and changes in body weight were reported, with no restrictions regarding the sex, race, or ethnicity of participants or language, sample size, publication status, or publication date. Studies in children were not included because weight status in children is commonly reported differently from that in adults, and because there are few, if any, intervention trials assessing the effect of plant-based diets on children's weight. The primary comparator was weight change in an untreated control group. Secondary analyses were conducted using the pre-intervention weight in the diet intervention group as a comparator.

Information Sources and Search Strategy

Articles were identified by searches of PubMed (1946 through December 31, 2013), EMBASE (1947 through December 31, 2013), and the Cochrane Central Register of Controlled Trials (1966 through December 31, 2013). The following syntax was used for the PubMed search: ("Diet, Vegetarian" [MeSH Terms] OR vegan OR vegetarianism) AND ("body weight" [MeSH Terms] OR "weight" [All Fields]), restricted to clinical trials and humans. Analogous terms were used for the EMBASE and Cochrane searches. Studies were excluded if participants had a physical condition that would be expected to affect body weight (eg, pregnancy, renal disease, or advanced cancer), if the energy content of the intervention diet was controlled to prevent or promote weight loss, if specific instructions to significantly increase physical exercise were provided, or if fasting was a prominent part of the intervention (eg, a fast longer than 10% of the intervention period).

Two researchers independently reviewed the titles and abstracts of all citations produced by the search. For citations appearing to meet the inclusion criteria, the same researchers independently reviewed full-text articles to identify eligible studies. Disagreements were resolved by consensus. From the reference lists of reviewed articles, additional articles were identified and reviewed for eligibility and, when possible, authors of the identified articles were contacted for additional information. Research experts were contacted to assess the possibility of additional articles.

Data Extraction

Two investigators independently extracted data from the selected studies using a data-extraction table, which was piloted using 10 references and revised accordingly. For studies producing multiple reports, the most recent and complete reports were used. The extracted data included study location; population demographics, number, and clinical characteristics; study design; intervention, including diet type, duration of observation, means for supporting participants in making diet changes (eg, classes, telephone calls), and methods for assessing dietary adherence; comparator group; energy intake; and weight changes, including measures of variability.

The principal variable of interest was the mean absolute change in body weight over the course of each study, comparing weight changes in diet intervention groups to those of untreated control groups, when available. For studies reporting body weight data at multiple time points, weight data for the longest duration of observation were used in the meta-analysis.

Quality Measures

Using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions*, the quality of the studies included in the statistical analysis was assessed.[7] These criteria included measures to minimize bias in selection (random sequence generation and allocation concealment), performance, detection, attrition (incomplete outcome data), and reporting. Masking regarding diet assignment was not used as a quality criterion, because it is impracticable in studies of prescribed diets.

Synthesis of Results

Study results were analyzed in two ways, to the extent permitted by available data: an intention-to-treat analysis in which baseline values were used to substitute for any missing post-intervention values, and a completer analysis in which participants with missing post-intervention data were omitted. The former method assesses the effect of prescribing a diet change whether it is followed or not (assuming that subjects with missing outcomes data did not follow the prescribed diet and had no change in weight from pre-intervention); the latter reflects the effect of making a diet change. When published data were insufficient for these analyses, the authors of the original studies were asked to supply these data.

Estimates of overall weight change associated with the prescription of vegetarian diets were derived using a random effects model to estimate the weighted mean difference. While a fixed effects model assumes that the true effect size is the same in all studies, a random effects model allows the true effect to vary among studies (which we believed to be reasonable, as study duration, diet details, and other important factors differed among the studies examined).[8] The resulting meta-analysis modeled the observed effect in any study as deviation of that study's true effect from the overall mean effect of diet across all studies, along with the deviation of the effect actually observed in the study from the study's true effect.[8] The meta-analysis assigned a weight to each study based on the inverse of the estimated precision of the treatment effect observed in that study. To assess heterogeneity among studies, we calculated I^2 (estimated proportion of total variation across studies due to heterogeneity rather than chance variation).[9]

To assess publication bias (the effect of studies being unavailable for review because they were never published), funnel plots were created to check for symmetry about the mean effect size. Egger's regression test,[10] regressing effect size on estimated precision, was also conducted to quantify any bias seen in the funnel plots. We also calculated the fail-safe number, a measure of how many missing studies would

Download English Version:

https://daneshyari.com/en/article/5870102

Download Persian Version:

https://daneshyari.com/article/5870102

Daneshyari.com