Association of Intentional Changes in Body Weight with Coronary Heart Disease Event Rates in Overweight Subjects Who Have an Additional Coronary Risk Factor

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Despite evidence that weight loss improves the severity of coronary heart disease (CHD) risk factors, a direct association between weight loss and CHD incidence has not been demonstrated. In 1994–2001, the authors conducted an observational study of intentional weight loss as related to CHD incidence among patients recruited from a network of clinics in Israel who received nutritional counseling from a dietitian to support the medical recommendation to lose weight. Subjects were outpatients aged 50–75 years with a body mass index of ≥27 kg/m², without CHD or cancer but with at least one risk factor for CHD in addition to overweight. Outcomes were documented over 4 years by repeated weight measurements and by medical record verification. Among 1,669 patients, 224 (13.4%) incidents of CHD were recorded. For subjects who underwent at least 6 months of dietetic counseling, the risk-factor-adjusted odds ratio for CHD incidence associated with a weight loss of 4.5 kg (the median level of weight loss) was 0.57 (95% confidence interval: 0.39, 0.84). In this, the largest known study of its type reported to date, intentional weight loss from a 6-month diet predicted lower incidence of CHD over 4 years.

body weight; coronary disease; counseling; nutrition; weight loss

Abbreviations: BMI, body mass index; CHD, coronary heart disease; CI, confidence interval; SD, standard deviation.

Overweight is a risk factor for general morbidity as well as for morbidity and mortality arising specifically from coronary heart disease (CHD) (1–3). Despite evidence that weight loss decreases the severity of CHD morbidity risk factors (4–6), a direct association between weight loss and CHD morbidity and mortality has not been demonstrated to our knowledge. In some studies, there was a positive association between weight loss and cardiovascular-related death (3, 7–10), while others found no such association (11–13). However, note that in most studies, weight is merely reported (8, 14, 15) but seldom measured (9, 16). Studies that investigated measured weight change found no difference between patients reporting being on a diet and other patients (17). The relation between weight loss and increased mortality is undefined because of increased risk for people with latent disease (18). The association between weight loss rate for a voluntary low-calorie diet and morbidity and mortality has not been thoroughly investigated. Critique aimed at previous research contended that voluntary weight loss can occur concomitantly with a latent disease or that reported weight losers differ from others regarding their health awareness (17, 18).

Our objective was to determine, in a historical prospective study, whether voluntary weight loss and/or weight loss rate among overweight people with CHD risk is associated with the incidence of CHD or mortality. This hypothesis was tested by following subjects participating in a voluntary weight loss dietary counseling program for 3 months or more. Participants were overweight, with a body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) of at least 27 kg/m² and at least one additional coronary risk factor. We tested whether voluntary weight loss is associated with an increase in cardiac morbidity and/or mortality, except cancer, during a mean follow-up period of 4 years (2–98 months).

The exposure variable was intentional weight loss under nutritional supervision for at least 10 weeks. We examined coronary endpoints including International Classification of...
Patients aged 50–75 years were selected for the study from 30 Maccabi Health Services nutritional counseling clinics in central Israel. Patient files for men and women fulfilling the following criteria were registered: BMI $\geq 27$ kg/m$^2$ and at least one additional coronary risk factor defined as diabetes, hypertension, dyslipidemia, CHD in a first-degree relative, cerebrovascular accident in a first-degree relative, hyperuricemia (repeated blood uric acid $>8.2$ mg% in men and $>6.1$ mg% in women, or gout), and BMI $\geq 35$ kg/m$^2$, as reported in the medical files. All data, accumulated from a pre-prepared questionnaire, were collected from January 1, 1994, to November 1, 2001. Data were ascertained for morbidity and mortality through the Maccabi central computer files. The endpoint diagnoses were based on International Classification of Diseases, Ninth Revision codes registered in the physicians’ files as a primary and secondary diagnosis or in-hospital summary reports.

In this study, nutritional supervision implied regular visits with a clinical nutritionist. The supervision process included two to five meetings during the first 3 months and at least one visit every 3 months, up to 24 months for all participants. The nutritionists are graduates of the Hebrew University Faculty of Agriculture who were subsequently trained in seminars in the Maccabi Health Services in central Israel. Diets for overweight subjects who had CHD risk factors were based on the National Cholesterol Education Program guidelines (19) and considered the person’s lifestyle. Diabetics received an adapted diet based on the recommendations of the American Diabetes Association and the American Dietetic Association (20). The follow-up extended from January 1, 1996, until November 30, 2001. Adjudicators of coronary event status were blinded to weight loss status. The study was approved by the institutional review board of the Tel Aviv University Sackler Faculty of Medicine and Maccabi Health Services and was performed in accordance with the guidelines proposed in the Declaration of Helsinki.

Sample size

We used PEPI software, the SAMPLES routine, to calculate a sample size for proportion comparisons (21). We aimed for 2,000 subjects under nutritional supervision, of whom about 25 percent were expected to represent the subgroup who failed to lose weight despite dietetic supervision (the control group). It was anticipated that this sample size would provide ample statistical power to determine CHD incidence.

Data analysis

We calculated incidence rates for CHD after adjustment for diabetes, hypertension, and hypercholesterolemia. Patients diagnosed with cancer were excluded. Weight loss was repeatedly calculated during the follow-up period and was divided into quartiles according to follow-up period.

The association of weight change with morbidity was estimated by using multivariate analysis adjusted for the following possible confounders: age, sex, diabetes mellitus (as reported in the medical files, based on International Classification of Diseases, Ninth Revision codes, glucose values, HbA1C (glycosylated hemoglobin) value, and diabetes drug prescriptions), hypertension ($\geq 140/90$ mmHg, as reported in the medical files), smoking (present vs. past or never), hypercholesterolemia (cholesterol $\geq 240$ mg/100 ml, or use of cholesterol-lowering medications), initial BMI, and reported physical activity (at least once a week vs. not at all). Alcohol consumption was not included as a confounder since 91 percent of those who reported, reported no alcohol consumption at all, and 98 percent reported consuming less than one glass a day.

CHD incidence was compared between the two weight loss groups by using the $\chi^2$ model. We calculated the relative risk for CHD incidence or mortality with a 95 percent confidence interval (CI).

Two different analyses were used to assess the association of weight loss with outcome. Both analyses used logistic regression to calculate the odds ratio for CHD incidence. Regression coefficients in the logistic model approximate those derived in the proportional hazards model, when follow-up time is short and events are infrequent. In the first analysis, using weight loss as a continuous variable, we calculated the estimated odds ratio associated with a loss of 4.5 kg by addressing weight loss as a continuous variable. In addition, we also calculated the odds ratio for a dichotomous categorical variable representing weight loss above or below the median weight loss (4.5 kg after 6 months).

RESULTS

Mean initial BMI was 32.3 (standard deviation (SD), 4.3) kg/m$^2$. Mean nutritional follow-up time was 7.6 (SD, 4.9) months (minimum, 10 weeks; maximum, 25.7 months). Mean weight loss after 6 months on the diet was 5.0 (SD, 4.3) kg (between a 28.9-kg weight loss and a 9.3-kg weight gain). Mean follow-up from the beginning of dietary counseling until a CHD event, death, or the end of follow-up was 4.0 (SD, 1.5) years (minimum, 2 months; maximum, 98 months). We collected 2,528 questionnaires, of which 125 were initially excluded because of dieting before January 1, 1994, less than at least 10 weeks on the diet, and duplicate coding. Data analysis was carried out on 2,403 questionnaires, and 409 cancer patients were excluded. Of the remaining 1,994 questionnaires, those for 229 patients with preexisting CHD and 62 patients with CHD codes, who had already been recorded in the Maccabi central computer but not recorded by the dietitian, were excluded. Patients who had a coronary event before the second weight measurement within 2 months of beginning the diet were also excluded ($n = 25$). Therefore, a total of 316 patients were excluded because of CHD prior to the diet (13.2 percent of the research sample). Among those who fulfilled the inclusion criteria, nine were lost to follow-up. This loss could be...
explained by errors in identification or the fact that these patients may have left the Maccabi Health Services. Consequently, no data are available for this group. Therefore, the final data analysis was conducted on 1,669 subjects, who constituted the study group.

In the study group, 21 subjects died during follow-up (1.26 percent), of whom six were diagnosed with CHD after beginning the diet, a number too small for detailed analysis. In the study group were 224 patients (13.4 percent) who experienced coronary events. Comparisons were made between those who lost weight and their counterparts who did not lose weight.

Intentional weight loss of 4.5 kg during 6 months of dietetic supervision and 4 years of follow-up was related to a reduced risk of CHD. The lowest adjusted odds ratio was found for subjects who dieted for at least 6 months. For these persons, the odds ratio for CHD for losing 4.5 kg was 0.68 (95 percent CI: 0.54, 0.85) (adjusted for sex, age, diabetes, hypertension, smoking, and hypercholesterolemia) after an average of 4 years from the time they began dieting. Further adjustment for initial BMI and physical activity reduced the study group to \( n = 941 \) (because of missing data), with an odds ratio of 0.69 (95 percent CI: 0.54, 0.89) for CHD associated with losing 4.5 kg. When the odds ratio was calculated after adjustment for age and sex only, it was 0.70 (95 percent CI: 0.58, 0.85). Table 1 shows baseline characteristics, by weight loss quartile, for subjects who dieted for at least 6 months. Table 2 shows the odds ratios for CHD events among subjects losing 4.5 kg considered as a continuous variable, during different dietetic follow-up periods. The odds ratio, adjusted for sex and age for CHD at the end of follow-up, was 0.77 (95 percent CI: 0.65, 0.91). Further adjustment for diabetes, hypertension, smoking, hypercholesterolemia, initial BMI, and physical activity did not change the results.

### Table 1. Baseline characteristics, by weight loss quartile, of subjects who dieted for at least 6 months, Israel, 1994–2001

<table>
<thead>
<tr>
<th>Weight loss quartile</th>
<th>1 (n = 335)</th>
<th>2 (n = 321)</th>
<th>3 (n = 347)</th>
<th>4 (n = 333)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age (years (SD*))</td>
<td>58.6 (7.2)</td>
<td>58.1 (7.0)</td>
<td>58.5 (7.4)</td>
<td>56.0 (6.0)</td>
</tr>
<tr>
<td>Male sex (%)</td>
<td>33.1</td>
<td>28.7</td>
<td>35.2</td>
<td>51.7</td>
</tr>
<tr>
<td>Hypercholesterolemia (%)</td>
<td>48.7</td>
<td>53.3</td>
<td>51.9</td>
<td>43.5</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>42.1</td>
<td>45.8</td>
<td>45.5</td>
<td>44.1</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>44.5</td>
<td>26.8</td>
<td>25.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Present smoker (%)</td>
<td>15.6</td>
<td>11.3</td>
<td>12.5</td>
<td>21.2</td>
</tr>
<tr>
<td>Mean initial body mass index† (SD)</td>
<td>31.7 (4.5)</td>
<td>32.0 (3.9)</td>
<td>32.3 (3.8)</td>
<td>33.9 (4.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseline factors</th>
<th>p for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Weight loss range (kg)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Mean body mass index after 6 months (SD)</td>
<td>0.001</td>
</tr>
<tr>
<td>Coronary heart disease incidence (%)</td>
<td>0.003</td>
</tr>
<tr>
<td>OR†,‡ (95% CI†) compared with quartile 1</td>
<td>0.66 (0.40, 1.10)</td>
</tr>
</tbody>
</table>

* SD, standard deviation; OR, odds ratio; CI, confidence interval.
† Weight (kg)/height (m)².
‡ Adjusted for sex, age, diabetes, hypertension, smoking, hypercholesterolemia, and initial body mass index.

### Table 2. Estimated odds ratios for coronary heart disease associated with study subjects’ loss of 4.5 kg considered as a continuous variable, during different dietary follow-up periods, Israel, 1994–2001

<table>
<thead>
<tr>
<th>Variable</th>
<th>No.*</th>
<th>OR†,‡</th>
<th>95% CI†</th>
<th>No.*</th>
<th>OR§</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months</td>
<td>1,595</td>
<td>0.82</td>
<td>0.66, 1.01</td>
<td>1,120</td>
<td>0.78</td>
<td>0.60, 1.02</td>
</tr>
<tr>
<td>6 months</td>
<td>1,336</td>
<td>0.70</td>
<td>0.58, 0.85</td>
<td>911</td>
<td>0.69</td>
<td>0.54, 0.89</td>
</tr>
<tr>
<td>9 months</td>
<td>546</td>
<td>0.76</td>
<td>0.58, 0.99</td>
<td>390</td>
<td>0.69</td>
<td>0.48, 1.01</td>
</tr>
<tr>
<td>Weight change at the end of the diet period</td>
<td>1,669</td>
<td>0.77</td>
<td>0.65, 0.91</td>
<td>1,180</td>
<td>0.77</td>
<td>0.63, 0.94</td>
</tr>
<tr>
<td>Weight change in subjects who dieted for exactly 6 months</td>
<td>773</td>
<td>0.70</td>
<td>0.53, 0.93</td>
<td>535</td>
<td>0.75</td>
<td>0.52, 1.06</td>
</tr>
</tbody>
</table>

* Number of patients for whom data were complete at each different time period.
† OR, odds ratio; CI, confidence interval.
‡ Adjusted for sex and age.
§ Adjusted for sex, age, diabetes, hypertension, smoking, hypercholesterolemia, initial body mass index, and physical activity.
Those used for the sample size calculations.

rate of 16.8 percent. Both of these CHD rates are lower than

continuous nutritional counseling, with an expected 5-year follow-up

over an average 4-year follow-up period from the beginning

(95 percent CI: 0.52, 0.84) (adjusted for the above parameters),

losing 4.5 kg, which occurred for 1,336 subjects, was 0.66

(95 percent CI: 0.52, 0.84) (adjusted for the above parameters).

The CHD incidence rate in our study was 13.4 percent

over an average 4-year follow-up period from the beginning

of nutritional counseling, with an expected 5-year follow-up

rate of 16.8 percent. Both of these CHD rates are lower than

those used for the sample size calculations.

Weight loss and diabetes

Diabetes can act as a potential confounder in various ways:
Undiagnosed diabetes may result in accelerated unintentional
weight loss even under nutritional supervision. When
this happens, the confounding effect of diabetes on CHD
may attenuate the odds ratio since diabetics who lose more
weight may experience higher CHD morbidity. On the other
hand, stable diabetics are known to undergo an attenuated
weight loss. We conducted a sensitivity analysis, excluding
prevalent diabetics.

After exclusion of diabetics (n = 493), the odds ratio for
the incidence of CHD among subjects who lost 4.5 kg
compared with those who lost less or gained weight was 0.52
(95 percent CI: 0.30, 0.88) (adjusted for sex, age, diabetes,
hypertension, smoking, hypercholesterolemia, initial BMI,
and physical activity). For diabetics, the adjusted odds ratio
for CHD was 0.57 (95 percent CI: 0.29, 1.14) for those who
lost at least 4.5 kg compared with their counterparts who did
not lose this amount of weight (n = 282).

Table 3 summarizes the estimated odds ratios for CHD
associated with a categorical weight loss of 4.5 kg, according
to different strata, for subjects who dieted for at least 6
months.

Weight loss and initial BMI

Weight loss may differ between initial BMI groups
because of different rates of diabetes in lower versus higher
BMI categories and a potential very high risk in the lower
BMI and lower weight reduction group. We therefore added
a separate analysis for two categories of initial BMI: overweight
(BMI <30 kg/m2; n = 578) and obesity (BMI ≥30
kg/m2; n = 1,091). The odds ratios for CHD (adjusted for sex,
age, hypertension, smoking, hypercholesterolemia, initial
BMI, and physical activity) in the lower BMI category was
0.46 (95 percent CI: 0.23, 0.94) for those who lost at least 4.5
kg compared with others. In the higher BMI category, the
adjusted odds ratio for those who lost at least 4.5 kg
compared with others was 0.57 (95 percent CI: 0.33, 0.96).

Diabetes prevalence in overweight and obese patients was
identical: 28.9 percent in those with a BMI <30 kg/m2 and
28.4 percent in those with a BMI of ≥30 kg/m2.

Weight loss in overweight participants (BMI <30 kg/m2)
was smaller compared with that for obese subjects (BMI ≥30
kg/m2): mean, 3.8 (SD, 3.5) kg versus 5.5 (SD, 4.4) kg,
respectively; p < 0.0001. However, the odds ratio for CHD
associated with a weight reduction of at least 4.5 kg was
lower in both groups compared with those who lost less than
4.5 kg or gained weight.

Weight loss and gender

Mean weight loss after 6 months was 5.7 (SD, 4.4) kg
among men and 4.5 (SD, 4.1) kg among women. CHD inci-
dence associated with a weight loss of at least 4.5 kg (the
median) was lower among men who continued with dietetic
supervision for at least 6 months compared with those who
failed to lose 4.5 kg (17.3 percent vs. 24.1 percent, respec-
tively; p = 0.063). The odds ratios for CHD in the above two

FIGURE 1. Survival curve demonstrating the absence of coronary heart disease incidence among 1,336 overweight study subjects in Israel who lost ≥4.5 kg vs. <4.5 kg during 6 months of nutritional counseling between 1994 and 2001. Odds ratio = 0.62 (95% confidence interval: 0.43, 0.89) adjusted for sex, age, hypertension, diabetes, smoking, hypercholesterolemia, initial body mass index, and physical activity.
weight loss groups were 0.57 (95 percent CI: 0.32, 0.99) for men and 0.46 (95 percent CI: 0.24, 0.88) for women, adjusted for age, diabetes, hypertension, smoking, hypercholesterolemia, initial BMI, and physical activity. The same trend was found for a weight loss rate of at least 800 g/month (23.4 percent vs. 17.8 percent, respectively; \( p = 0.126 \)), and the age-adjusted odds ratio was 0.71 (95 percent CI: 0.46, 1.1; \( p = 0.126 \)). CHD incidence associated with a weight loss of at least 4.5 kg among women who continued with dietetic supervision for at least 6 months was significantly lower than among those who failed to lose that amount of weight (6.5 percent vs. 12.6 percent, respectively; \( p = 0.003 \)). The same applied to a weight reduction rate of at least 800 g/month over 6 months (6.1 percent vs. 13.0 percent, respectively; \( p = 0.001 \)). The age-adjusted odds ratio for CHD among the above two groups of weight loss in women was 0.43 (95 percent CI: 0.26, 0.71; \( p = 0.001 \)). Despite the lower success rate for women who lost weight (at least 4.5 kg after 6 months for 46.0 percent of women compared with 59.2 percent of men; \( p = 0.0001 \)), this difference became apparent after only 3 months in women compared with after 6 months in men. Despite a significant difference in weight reduction among subjects diagnosed with and without CHD—mean, 3.9 (SD, 3.7) kg versus 5.1 (SD, 4.3) kg, respectively; \( p < 0.0001 \) after 6 months of dietetic supervision—the groups did not differ in absolute weight and BMI at any stage of the study.

**DISCUSSION**

The aim of the present research was to determine whether CHD events in overweight persons who have an additional CHD morbidity risk factor, and who lose weight intentionally, vary among those who lose differing amounts of weight and have different weight loss rates. A total of 1,669 subjects were included in the present study, which is a far larger number than any previous study for assessing the association between weight change and CHD incidence. In the present study, CHD was assessed after an average period of 8 months of dietetic supervision and up to an average period of 4 years from the beginning of dietary supervision. The lower-than-expected morbidity found in our study may be related to improved medical treatment for coronary risk factors (22–31); therefore, analysis was carried out on CHD morbidity only. Previous studies with a similar dietary follow-up period, investigating the correlation with coronary morbidity, lacked follow-up after the end of dietetic supervision. The use of a composite coronary endpoint has become acceptable in the literature (9, 16, 31) and was thus used in the present study.

The results show that those who lost more weight experienced a lower incidence of CHD. Weight reduction of 4.5 kg during 6 months of dietetic supervision, or a weight loss rate of at least 800 g/month, was associated with up to a 30 percent reduced coronary risk for subjects in the study group (table 2). A dichotomous categorical variable was added because using a cutoff point for weight loss may help the dietitian set a target weight associated with a better outcome (figure 1). Greater weight loss and weight loss rate, but not lower BMI, predicted lower CHD incidence. These results concur with those from the Nurses’ Health Study report, which showed only a 3–4 percent increased average risk for a 1-kg/m² higher BMI (32), but not with other reports in which elevated BMI was more predictive of CHD incidence (33). In our study, the odds ratio for CHD events was adjusted for age, sex, diabetes, hypertension, and hypercholesterolemia to determine whether the relation between weight loss and coronary events resulted from baseline differences in known risk factors between the weight loss groups (table 1). Risk factors can act as mediators in the association between overweight and CHD (2, 34), and weight reduction may reduce the risk of CHD through its mediating effect on these risk factors. Adjustment for risk factors would have lowered the odds ratio associated with weight reduction but would not have eliminated or decreased the importance of the association between weight reduction and CHD.

In the study group, at least 6 months of dietetic follow-up were needed to identify a significant difference in the rate of events between those who lost and those who failed to lose

| TABLE 3. Estimated odds ratios for coronary heart disease associated with a categorical weight loss of 4.5 kg, according to different strata, for study subjects who dieted for at least 6 months, Israel, 1994–2001 |
|---------------------------------|-------|--------|-----------------|
| Strata                          | No.*  | OR†‡   | 95% CI†         |
| Diabetics                       | 282   | 0.57   | 0.29, 1.14      |
| Nondiabetics                    | 659   | 0.70   | 0.58, 0.85      |
| Subjects whose initial body mass index§ was <30 | 318   | 0.46   | 0.23, 0.94      |
| Subjects whose initial body mass index was ≥30 | 623   | 0.57   | 0.33, 0.96      |
| Men                             | 356   | 0.57   | 0.32, 0.99      |
| Women                           | 585   | 0.46   | 0.24, 0.88      |

* Number of patients for whom data were complete after adjustment.
† OR, odds ratio; CI, confidence interval.
‡ Adjusted for sex, age, diabetes, hypertension, smoking, hypercholesterolemia, initial body mass index, and physical activity.
§ Weight (kg)/height (m)².
weight (table 2). In women, the positive effect of weight loss on CHD was observed after 3 months, possibly because of their larger group size as compared with men. In addition, it is also possible that the women showed greater benefit from intentional weight loss because they were more motivated than the men to maintain their weight loss. If a change in morbidity is related to weight loss, it could be that a minimal time span is needed for nutritional follow-up to influence CHD incidence. In the present study, weight loss demonstrated more advantageous effects for women than for men.

Weight measurements

Of particular importance is the fact that the present study relied on actual weight rather than on reported weight measurements. Other than the Honolulu Heart Study, Framingham, and Israeli Ischemic Heart Disease studies (10, 17, 35), epidemiologic studies have relied on reported weight change rather than on actual measurements (8, 11, 13–15, 36). Weight and weight loss assessments based on reported weight and height may be subject to underestimation and low validity (15). In the present study, weight reduction was achieved by adhering to a balanced diet with the help of professional counseling from registered dietitians and did not rely on an unknown diet or on a diet affirmed by the patient.

Weight loss and latent disease

In people who intend to lose weight, weight loss due to latent disease might be mistakenly considered intentional weight loss (3, 8, 9, 16, 36). Even studies that recalled the intention to lose weight were based on reported weight (17, 37–39) and were therefore exposed to recall bias. In the present study, all participants intended to lose weight; therefore, excluding cancer patients prevented confounding of diet-driven weight loss by weight loss resulting from disease. The possibility of unintentional weight loss despite dietary counseling was reduced, although not eliminated, by excluding subjects with cancer during the follow-up and cases of CHD that occurred prior to and 2 months into the diet.

Limitations

There are several limitations to this study. Waist-to-hip ratio, together with other anthropometric measurements, is preferable to BMI alone (40). Waist-to-hip ratio was not routinely measured in the clinics in which the present study was performed, whereas height and weight were available in all (41). The present study could not determine whether failure to reduce weight appropriately causes increased morbidity or whether persons at high CHD risk, for whatever reasons, tend to lose less weight. Success in losing weight might reflect high compliance with medications and/or lifestyle modification, improving general health in these persons. Thus, weight reduction alone cannot be ascertained as the sole factor underlying lower CHD incidence. No data were available in the present study regarding intentional weight loss over a longer time period after the end of nutritional counseling (an average period of 3.4 years). It is possible that both weight reduction and its benefits may dissipate over a longer follow-up period. However, assuming that most persons who lose weight regain all or part of the reduced weight up to 5 years after a diet is discontinued (42), the results of the present study show that moderate weight reduction may affect the incidence of CHD within a few years. The biologic explanation for this question remains to be solved.

Conclusions

In the current study, the largest known on this subject to date, a 4-year lower CHD morbidity rate was found for subjects losing more than 4.5 kg during a 6-month diet. Subjects aged 50–75 years with a BMI of at least 27 kg/m² and at least one additional coronary risk factor should be referred for dietetic supervision.

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