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Advice on low-fat diets for obesity (Review)

Pirozzo S, Summerbell C, Cameron C, Glasziou P. Advice on low-fat diets for obesity. *Cochrane Database of Systematic Reviews* 2002, Issue 2. Art. No.: CD003640. DOI: 10.1002/14651858.CD003640.

Wisdom of the Land

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BACKGROUND

THE PROBLEM OF OBESITY

- Every two adults in the USA is either overweight or obese, an increase of 25% over the last three decades
- In most countries ofWestern Europe the prevalence of obesity in adults is 10% to 25% and in some countries in the Americas it is 20% to 25%.
- Women in Eastern European and Mediterranean countries the prevalence of obesity increases up to 40%(WHO1998).
- In theUK, the prevalence of obesity has more than doubled between 1980 and 1993, a trend that is similar for both men and women of all age groups (Carmichael 1999).

COSTS

- The health and economic costs of excessive weight are enormous. Overweight and obesity are associated with an increased incidence of a number of diseases and risk factors, including cardiovascular disease, type 2 diabetes, hypertension, stroke, dyslipidemia, osteoarthritis and some cancers (Burton 1985;Must 1999).

MANAGEMENT OPTIONS

- Whilst methods of weight reduction such as calorie restriction diets and appetite suppressant drugs have reasonably good short term effects, at one and two year follow-ups most of this weight had been regained. A recent review of long-term outcomes for dietary treatment of obesity found a 15% success rate among 2131 individuals followed for a median of five years after a dietary intervention (Ayyad 2000).
- Success was defined as maintenance of all weight initially lost (or further weight reduction) or maintenance of at least 9 to 11 kg of initial weight loss. In all studies, the initial diet of the participants was either a very low calorie diet or a low calorie diet.

LOW FAT DIETS

- An alternative approach to restricting the total energy content of the diet is to alter the fat content of the diet. By shifting the dietary pyramid from high-fat foods to low-fat, high carbohydrate foods (preferably complex carbohydrates)
- A more recent meta-analysis by Astrup (Astrup 2000) on the role of dietary fat in body fatness concluded that dietary fat restriction prevented weight gain in participants of normal weight and produced a weight loss in overweight participants. However, of the 16 trials included in this review, none had weight loss as the primary goal. It is possible that people with disease aremoremotivated to adhere to a diet, and it is therefore not clear how effective low-fat diets are in achieving sustained weight loss when used for the express purpose of weight loss in obese or overweight people.

LOW FAT DIETS

- Aim of this systematic review was to assess the efficacy of low-fat diets compared with other weight reducing diets in achieving long-term weight loss among overweight and obese people. To stay as near as possible to the 'real life' situation, we focus on advice given to people on low fat diets, rather than including interventions provided under artificial conditions, for example diets provided free of charge or commercially produced diets.

OBJECTIVES

- To assess the effects of advice on low-fat diets as a means of achieving sustained weight loss, using all available randomised clinical trials

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CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

- Types of studies
  - All RCTs of advice on low-fat diets vs other weight-reducing diets
  (a) the primary purpose of the study was weight loss, and
  (b) Follow up for at least six months.
- Types of participants
  - Adults
  -18 years or older
  - Overweight or obese (BMI >25 kg/m2)
  Studies including pregnant women or patients with serious medical conditions were excluded.
- Types of intervention
  - Advice about how to achieve a diet with less than or equal to 30% of calories coming from total fat
  - Provided by dietitians, health professionals, or investigators in verbal or written form.
  - The comparison intervention could be any type of weight-reducing diet apart from a low-fat diet. Trials were excluded
  (a) provided, either free of charge or for payment, or
  (b) commercially produced or consisting of whole diet substitutes.

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CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

- Types of outcome measures

Main outcome

1. Indicators of body mass (for example, weight, body mass index (BMI))

Additional outcomes

1. Mortality (total and cardiovascular)
2. Cardiovascular events (myocardial infarction, stroke)
3. Serum lipids (total cholesterol, HDH cholesterol, LDL cholesterol, triglycerides)
4. Blood pressure
5. Glycated haemoglobin and fasting plasma glucose
6. Adverse effects of diet
7. Quality of life

- Timing of outcome measures

Short (6m.), Medium (7-12m.), Long (>12m.)

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SEARCH METHODS FOR IDENTIFICATION OF STUDIES

The Cochrane Controlled Trials Register (Cochrane Library Issue 2, 2001), MEDLINE, EMBASE, Science Citation Index, bibliographies, and handsearching. The original searches of MEDLINE and EMBASE were conducted from the beginning of each database until January 2001. The search was updated in February 2002

ELECTRONIC SEARCHES
The Cochrane Library includes search results from several electronic databases and handsearch results from multiple journals.
#1 DIET (MeSH term, all subheadings included)
#2 DIET (in the text)
#2 WEIGHT-LOSS (MeSH term, all subheadings included)
#3 WEIGHT next LOSS (in the text)
#4 WEIGHT next REDUC* (in the text)
#5 WEIGHT next INCREAS* (in the text)
#6 #1 or #2 or #3 or #4 or #5

The MEDLINE database was searched with a combined topic and publication type search (written for Silver Platter).
TOPIC SEARCH
#1 DIET (MeSH term, all subheadings included)
#2 DIETARY-FATS (MeSH term, all subheadings included)
#3 DIETARY-CARBOHYDRATES (MeSH term, all subheadings included)
#4 DIET-THERAPY (MeSH term, all subheadings included)
#5 DIET-FAT-RESTRICTED (MeSH term, all subheadings included)
#6 DIET-REDUCING (MeSH term, all subheadings included)
#7 #1 or #2 or #3 or #4 or #5 or #6
#8 ENERG* or CALORI* or CARBOHYDRATE* (in the text)
#9 FAT or FATS (in the text)
#11 DECREAS* or LOW* or RESTRICT* or REDUC* (in the text)
#12 FREE or INCREAS* or HIGH or AD LIB* (in the text)
#13 #11 or #12
#14 #10 with #13
#15 #7 or #14
#16 WEIGHT and #15 (in the text)
#17 (TG=ANIMAL) not (TG=HUMAN) and (TG=ANIMAL)
PUBLICATION TYPE - RANDOMISED CONTROLLED TRIALS
#18 RANDOMIZED-CONTROLLED-TRIAL (in publication type)
#19 CONTROLLED-CLINICAL-TRIAL in (in publication type)
#20 RANDOMISED CONTROLLED TRIALS (in the text)
#21 random-allocation (MeSH term, all subheadings included)
#22 double-blind-method (MeSH term, all subheadings included)
#23 single-blind method (MeSH term, all subheadings included)
#24 #18 or #19 or #20 or #21 or #22 or #23
COMBINED SEARCH
#25 #16 not #17
#26 #25 and #24

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SEARCH METHODS FOR IDENTIFICATION OF STUDIES

HANDSEARCHING

The references of two recent UK (Glenny 1997) and USA (NIH 1998) government-sponsored literature reviews of therapy for obesity were searched to identify relevant RCTs. The UK NHS Centre for Reviews and Dissemination prepared a report on interventions in the treatment and prevention of obesity. The search strategy for this review covered 23 electronic databases including MEDLINE (1966-96), EMBASE (1974-96), PsycLit (1967-96) and Science Citation Index (1974-95). The US National Institutes of Health recently convened a guideline panel on the treatment of obesity. To provide evidence for the panelists, the NIH searched MEDLINE (1984-1996) and references of retrieved articles. The NIH and NHS reviews required minimum study durations of four months and one year, respectively. The bibliographic references of all retrieved reports of RCTs and relevant reviews were assessed for additional reports of trials according to the criteria described above.

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METHODS OF THE REVIEW

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QUALITY ASSESSMENT OF TRIALS

The trials were assessed independently by two investigators using specific quality criteria adapted from Chalmers (Chalmers 1990).

DATA EXTRACTION

Three reviewers independently extracted data from the studies. Differences were resolved by the fourth reviewer.

DATA ANALYSIS

- Cochrane Review Manager (REVMAN) software and analysed usingMetaView.
- Random and fixed effects models to pool data
- Effect sizes are presented as weighted mean differences with 95% CI.
- Dichotomous variables as Mantel Haenszel odds ratios (OR) with 95% CI
- The chi-square method was used to assess heterogeneity with the significance set at $p<0.1$.

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1. Duration of intervention (short,medium, long - based on data)
2. Type of low-fat diet (fixed low-energy or ad-libitum)
3. Type of comparison diet (fixed low-energy , highmonounsatrated fat)
4. Length of follow-up (short term - 6 months, medium term -12 months, long term - 18 months)

Subgroup & Sensitivity Analyses

1. Repeating the analyses excluding any unpublished studies
2. Repeating the analyses taking account of study quality, as specified above
3. Repeating the analyses excluding any very long or large studies to establish how much they dominate the results
4. Repeating the analyses excluding studies using the following filters: diagnostic criteria, language of publication, source of funding (industry versus other), country

DESCRIPTION OF STUDIES

- Six trials (nine publications) were included in the review.
- All six of the included studies were parallel design, RCTs.
- The median study size was 106 participants with a range of 46 to 135
- The length of the intervention varied from three months (Baron 1986) to four months (Pascale 1995) to six months (Baxter 1995; Lean 1997;Harvey-Berino 1998) to 18months (McManus 2001).

DESCRIPTION OF STUDIES

Four studies (Baxter 1995; Lean 1997; Harvey-Berino 1998; McManus 2001)	6 months
Five studies (Baron 1986; Baxter 1995; Pascale 1995; Harvey-Berino 1998; McManus 2001)	12 months
Three studies (Baxter 1995; Harvey-Berino 1998; McManus 2001)	18 months

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DESCRIPTION OF STUDIES

PARTICIPANTS AND SETTING

- 594 participants in the six trials
- Participants ranged in age from 18 to 66 years with the mean age between 40 and 50 years.
- Either overweight or obese
- Participants were free from serious medical conditions
- All trials were conducted in a community setting in cities in the USA

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DESCRIPTION OF STUDIES

INTERVENTIONS

- low fat *vs* low calorie (Harvey-Berino 1998),
- fixed calorie low fat *vs* fixed calorie low carbohydrate (Baron 1986; Lean 1997)
- low fat ad libitum *vs* low calorie (Baxter 1995)
- fixed calorie low fat *vs* fixed calorie moderate fat (McManus 2001)
- fixed calorie low fat *vs* fixedcalorie (Pascale 1995).

group sessions

behavioural modification

DESCRIPTION OF STUDIES

OUTCOME MEASURES

Outcomes	Reported studies
weight loss	all studies
body mass index (BMI) at six months	all studies, apart from Baron 1986
percent body fat	Baxter 1995; Harvey-Berino 1998; Lean 1997; McManus 2001
waist-hip ratio	Baxter 1995; Lean 1997; McManus 2001

DESCRIPTION OF STUDIES

OUTCOME MEASURES

Outcomes	Reported studies
serum lipids	Baron 1986; Pascale 1995; Lean 1997
blood pressure	Lean 1997
fasting plasma glucose	Baron1986; Pascale 1995
adverse effects of the diet	Baron 1986
quality of life	Baxter 1995

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RESULTS

MAIN OUTCOME MEASURE - WEIGHT LOSS

Four studies (Baxter 1995; Lean 1997; Harvey-Berino 1998; McManus 2001)	6 months
Five studies (Baron 1986; Baxter 1995; Pascale 1995; Harvey-Berino 1998; McManus 2001)	12 months
Three studies (Baxter 1995; Harvey-Berino 1998; McManus 2001)	18 months

Analysis 01.01. Comparison 01 Low fat diet vs other type of diet, Outcome 01 Mean weight loss at 6 months

Review: Advice on low-fat diets for obesity

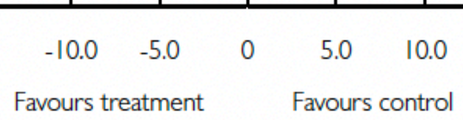
Comparison: 01 Low fat diet vs other type of diet

Outcome: 01 Mean weight loss at 6 months

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Baxter 1995	47	-4.40 (5.48)	42	-3.80 (5.20)		25.3	-0.60 [-2.82, 1.62]
Harvey-Berino 1998	28	-5.20 (4.60)	29	-11.80 (4.90)		24.5	6.60 [4.13, 9.07]
Lean 1997	42	-5.60 (4.90)	40	-6.80 (5.00)		25.5	1.20 [-0.94, 3.34]
McManus 2001	23	-5.10 (4.60)	31	-4.90 (4.30)		24.7	-0.20 [-2.61, 2.21]
Total (95% CI)	140		142			100.0	1.72 [-1.39, 4.83]

Test for heterogeneity chi-square=21.83 df=3 p=<0.0001 I^2 =86.3%

Test for overall effect z=1.09 p=0.3



Analysis 01.02. Comparison 01 Low fat diet vs other type of diet, Outcome 02 Mean weight loss at 12 months

Review: Advice on low-fat diets for obesity

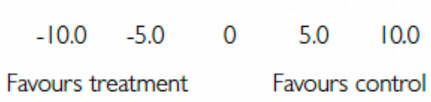
Comparison: 01 Low fat diet vs other type of diet

Outcome: 02 Mean weight loss at 12 months

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Baron 1986	61	-1.60 (5.20)	59	-2.30 (5.20)		25.4	0.70 [-1.16, 2.56]
Baxter 1995	39	-2.45 (5.00)	36	-0.82 (5.00)		24.0	-1.63 [-3.89, 0.63]
Harvey-Berino 1998	26	-3.00 (5.00)	22	-8.70 (5.00)		21.9	5.70 [2.86, 8.54]
McManus 2001	13	-5.00 (7.30)	27	-4.80 (5.20)		16.2	-0.20 [-4.63, 4.23]
Pascale 1995	16	-3.00 (8.40)	13	-3.50 (7.40)		12.4	0.50 [-5.26, 6.26]
Total (95% CI)	155		157			100.0	1.06 [-1.62, 3.75]

Test for heterogeneity chi-square=16.07 df=4 p=0.003 I^2 =75.1%

Test for overall effect z=0.78 p=0.4



Analysis 01.03. Comparison 01 Low fat diet vs other type of diet, Outcome 03 Mean weight loss at 18 months

Review: Advice on low-fat diets for obesity

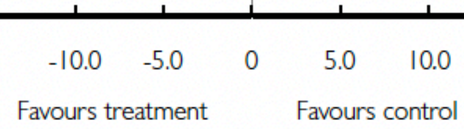
Comparison: 01 Low fat diet vs other type of diet

Outcome: 03 Mean weight loss at 18 months

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Baxter 1995	39	0.40 (5.00)	35	1.80 (5.00)		34.6	-1.40 [-3.68, 0.88]
Harvey-Berino 1998	26	-1.80 (5.00)	22	-7.50 (5.00)		33.5	5.70 [2.86, 8.54]
McManus 2001	30	2.90 (7.70)	31	-4.10 (6.50)		31.8	7.00 [3.42, 10.58]
Total (95% CI)	95		88			100.0	3.66 [-1.84, 9.15]

Test for heterogeneity chi-square=22.17 df=2 p=<0.0001 I^2 =91.0%

Test for overall effect z=1.30 p=0.2



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BMI at 6, 12, 18 months

Analysis 01.04. Comparison 01 Low fat diet vs other type of diet, Outcome 04 Mean change in BMI at 6 months

Review: Advice on low-fat diets for obesity
Comparison: 01 Low fat diet vs other type of diet
Outcome: 04 Mean change in BMI at 6 months

Study	Treatment N	Mean(SD)	Control N	Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Baxter 1995	47	-1.60 (2.10)	42	-1.50 (0.30)		28.2	-0.10 [-0.71, 0.51]
Harvey-Berino 1998	28	-1.80 (1.50)	29	-4.10 (1.70)		26.7	2.30 [1.47, 3.13]
Lean 1997	42	-2.20 (3.90)	40	-2.60 (3.90)		19.7	0.40 [-1.29, 2.09]
McManus 2001	23	-1.90 (1.90)	31	-2.00 (1.80)		25.4	0.10 [-0.90, 1.10]
Total (95% CI)	140		142			100.0	0.69 [-0.58, 1.96]

Test for heterogeneity chi-square=22.17 df=3 p=<0.0001 I² =86.5%
Test for overall effect z=1.07 p=0.3

-10.0 -5.0 0 5.0 10.0
Favours treatment Favours control

Analysis 01.05. Comparison 01 Low fat diet vs other type of diet, Outcome 05 Mean change in BMI at 12 months

Review: Advice on low-fat diets for obesity
Comparison: 01 Low fat diet vs other type of diet
Outcome: 05 Mean change in BMI at 12 months

Study	Treatment N	Mean(SD)	Control N	Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Harvey-Berino 1998	26	-0.50 (2.00)	22	-3.20 (2.00)		39.1	2.70 [1.56, 3.84]
McManus 2001	13	-1.80 (2.90)	27	-2.00 (2.10)		32.5	0.20 [-1.56, 1.96]
Pascale 1995	16	-1.10 (3.10)	13	-1.30 (2.80)		28.4	0.20 [-1.95, 2.35]
Total (95% CI)	55		62			100.0	1.18 [-0.69, 3.04]

Test for heterogeneity chi-square=7.62 df=2 p=0.02 I² =73.8%
Test for overall effect z=1.24 p=0.2

-10.0 -5.0 0 5.0 10.0
Favours treatment Favours control

Analysis 01.06. Comparison 01 Low fat diet vs other type of diet, Outcome 06 Mean change in BMI at 18 months

Review: Advice on low-fat diets for obesity
Comparison: 01 Low fat diet vs other type of diet
Outcome: 06 Mean change in BMI at 18 months

Study	Treatment N	Mean(SD)	Control N	Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
Harvey-Berino 1998	26	-0.60 (2.00)	22	-2.70 (2.00)		62.7	2.10 [0.96, 3.24]
McManus 2001	30	1.40 (3.30)	31	-1.60 (2.50)		37.3	3.00 [1.53, 4.47]
Total (95% CI)	56		53			100.0	2.44 [1.54, 3.33]

Test for heterogeneity chi-square=0.90 df=1 p=0.34 I² =0.0%
Test for overall effect z=5.31 p<0.00001

-10.0 -5.0 0 5.0 10.0
Favours treatment Favours control

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DISCUSSION

SUMMARY OF FINDING

- No real difference between a low fat diet and other weight-reducing diets in terms of long-term weight loss
- Harvey-Berino 1998 reported significantly greater reductions in weight among the control participants at all time points and McManus 2001 reported similar results at the 18 month follow-up. (High loss to F/U and clinically insignificant)
- The changes in other measures of effect, such as serum lipids and blood pressure,were also unremarkable and clinically insignificant.

LIMITATIONS

- Paucity of long-term studies
- The relatively large losses to follow-up