Table 3.1.6 *Observational studies on low-fat diet in persons with impaired glucosetolerance or impaired fasting glucose.*

First author Year Reference Country	**Study design Name of study Duration of follow-up**	**Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG**	**Intervention/exposure Number at baseline Drop outs due to death/other reasons Number at follow-up Number of outcome events**	**Method of dietary measurement Repeated measurements Confounders adjusted for**	**Results Effects/side effects Adherence to intervention**	**Study quality Comments**
Lindström 2006 [5] Finland	Observational study within an interven-tional, Finnish Diabetes Prevention Study, Follow-up 4.1 years	IGT and BMI >25 n=522 350 women Age: 55.7 years BMI: 31.4 kg/m^2	Multivariate intervention; advice on lifestyle changes 22 subjects did not have baseline or any follow-up data on dietary intake Outcomes: 114 converted to type 2 diabetes 3rd year dietary data, n=424 LOCF was used for patients that converted to DM before 3rd annual visit, n=58	3-day food registration using picture booklet of portion sizes of typical food items. food regi-stration checked by nutritionist at study visit Food registration repeated 3 times (annual). Data adjusted for group assignment, sex, age, physical activity (baseline and follow-up), nutrient intake and 2 hours OGTT glucose at baseline	Hazard ratio for diabetes incidence when comparing quartiles of increasing fibre Q4: 0.32 (95% CI 0.16–0.66), p=0.01, and total fat Q4: 2.18 (95% CI 1.17–4.04) p=0.004 Due to multicollinearity neither fibre nor fat intake could predict diabetes when adjusted for in the same model	Moderate No power analysis.

Table 3.1.7 *Intervention studies on low-fat diet in patients with diabetes.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG**	**Interventions/ reference group Number at baseline Drop out rate**	**Method of dietary measurement Repeated measurements**	**Results Effects/side effects Adherence to intervention**	**Study quality Comments**
Glasgow 1997 [13] USA	RCT using a table of random numbers Large medical group treating diabetes patients within the area of Oregon, USA 12 months follow-up	Having type 1 or type 2 diabetes, being 40 years of age or older (n=206) *I (brief intervention)* n=106–108 63% women/37% men 76% type 2 diabetes *C (usual care)* n=94–98 60% women/40% men 81% type 2 diabetes *Age (years)* I: 61.7±12.1 C: 63.1±10.5 *BMI (kg/m^2) (n=164)* I: 30.4 C: 30.2 *HbA_{1c} (%) (n=161)* I: 7.9 C: 7.9	*I (brief intervention)* To lower fat intake by working with behavioural and psychosocial components. Goal setting and problem solving techniques. Telephone follow-up at 1 and 3 weeks and 6 months. Repeated intervention at 3 months *C (usual care)* Continued regular care with follow-up at 3 and 12 months. No behavioural or psychosocial components *At baseline* I: n=106–108 C: n=94–98 *Drop out rate* At 12-months follow-up 16% I: 16.7% C: 15.3%	4-day food record and Kristal Food Habits Questionnaire (FHQ), a 20-item instrument for measuring fat related dietary habits	HbA_{1c} decreased by 0.1% in both study groups (NS) BMI increased in the intervention group by 0.1 and in the control group by 0.2 kg/m^2 (NS) Total cholesterol decreased more in the intervention group than in the control group (p=0.002) No adverse reactions reported in the study Adherence to the diets was assessed using a 4-day food record and the Kristal FHQ. Reduction in fat intake significantly bigger in intervention group but small in absolute numbers	High

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Glasgow 2000 [14] USA	RCT Procedure of randomisation not described 12 medical practices with 40 primary care physicians 3 and 6 months follow-up	Type 2 diabetes patients ≥40 years of age, living independently and having telephone (n=320) *Age (years)* 59.4±9.1 *HbA_{1c} (%)* Range of 7.3 to 7.6 as mean baseline values between groups	Factorial design of brief intervention (basic condition; BC) with or without telephone follow-up (TF) and community resources (CR) I1 (BC): Goal setting and problem solving techniques (1 to –2 hours), repeated after 3 months (n=80) I2 (TF): As in BC and 3–4 follow-up calls within 6 months (n=80) I3 (CR): As in BC and information of community resources (n=80) I4 (TF+CR): As in BC + TF and CR (n=80) *Drop out rate:* At 6-month follow-up 13%	Kristal Fat and Fibre Behavior Scale and Block Fat Screener	HbA_{1c} decreased by 0.1–0.2% in each treatment group (NS) Weight loss of about 1 kg in all groups (NS) Plasma lipid ratio of total cholesterol/HDL-cholesterol decreased slightly in all groups (NS) No adverse reactions recorded Adherence assessed using the Kristal Fat and Fibre Behavior Scale and the Block Fat Screener. A 50% decrease in fat intake in all groups was shown	High

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Clark 2004 [15] United Kingdom	RCT using computer-generated table Diabetes center within the UK National Health Service 3, 6 and 12 months	Type 2 diabetes patients with a BMI >25. Of 573 invited patients, 357 replied. Of these, 206 patients were interested in participation. 40 subjects were too ill and 66 subjects declined to participate. This resulted in 100 patients that were randomised 42 women/58 men Age: 59.5 (40–70) years BMI: 31 kg/m^2 (SD=3.99) HbA_{1c}: 8.4% (SD=1.64)	A brief lifestyle intervention, focusing on behavioural change (reduction of fat intake and increased physical activity) Using goal-setting, personalized strategies, motivational interviewing, a tailored intervention was formed at one session. Follow-up calls after 1, 3 and 7 weeks C: Usual care consisting of information at one session At baseline: n=100 12-month follow-up: n=94 *Drop out rate:* At 12-month follow-up 6% (n=6)	Using the Kristal Food Habits Questionnaire (FHQ) and the Block Fat Screener to assess the intake of fat Repeated measures are used in the evaluation of dietary habits and physical activity	Dietary behaviour was the primary outcome measure and showed that the intervention group used low-fat foods significantly more than control group at 3 and 12 months follow-up, but no difference in physical activity No significant differences between groups in BMI or waist circumference, nor in HbA_{1c} or plasma lipids. There was a significant reduction in waist circumference over time within the intervention group (–2 cm), and an increase over time in BMI in the control group No adverse reactions reported in the study Adherence to the intervention was followed for fat intake (FHQ) and physical activity	Moderate

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Barnard 2009 [16] USA	RCT using a randomisation list Area of Washington DC, USA Follow-up after 74 weeks	Individuals with type 2 diabetes recruited through newspaper advertisements. Of 1 049 subjects screened by telephone, 99 met participation criteria. Mean duration diabetes 8 years I: 27 women/22 men C: 33 women/17 men Size of study population motivated by power analysis *Age (years)* I: 56.7 (35–82) C: 54.6 (27–80) *BMI (kg/m^2)* I: 33.9±7.8 C: 35.9±7.0 *HbA_{1c} (%)* I: 8.05±0.16 C: 7.93±0.14	I: Low-fat vegan diet (about 10 E% fat, 15 E% protein, and 75 E% CHO). Unrestricted energy intake C: Conventional diet (15–20 E% protein, less than 7 E% saturated fat and 60–70 E% CHO and MUFA). Prescribed energy intake deficit of 500–1 000 kcal For all, 1 hour to establish a diet plan. Thereafter weekly 1-hour sessions for 22 weeks, followed by optional biweekly sessions for 52 weeks *At baseline* I: n=49 C: n=50 *Drop out rate at 74 weeks* 12% (n=12) for laboratory assessments and 16% (n=16) for dietary records. No reason given	Food record for 3-days at weeks 0, 11, 22 and 74 (on two weekdays and 1 weekend day) Repeated measurements were used in the analyses	HbA_{1c} was reduced in both groups (–0.34 for the vegan and –0.14 for conventional group; NS). If controlling for medication significantly greater reduction in the vegan group (–0.40 vs 0.01; p=0.03) Both diets associated with sustained weight reduction (–4.4 kg in the vegan and –3.0 kg in the conventional group; NS) No between-group differences in plasma lipids Dietary intake: At 74 weeks, fat intake (E%) in the vegan group 22.3 and in the conventional group 33.7 and CHO intake (E%) 66.3 vs 46.5, respectively. Total fibre intake (g/1 000 kcal) 21.7 in the vegan and 13.4 in the conventional group. All of these differences were highly significant No serious adverse effects At 74 weeks, all dietary adherence criteria were met by 51% of the vegan and 48% of the conventional diet group	High

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Metz 2000 [17] USA	RCT using a computer generated randomisation 5 university-based medical centers in the USA Follow-up after 1 year	This RCT was conducted in 2 separate cohorts and only the subgroup with type 2 diabetes will be presented here 69 women/50 men *Age (years)* I: 54.6±9.0 C: 54.0±9.9 *BMI (kg/m^2)* I: 33.0±4.4 C: 34.5±4.5 *FPG (mmol/L)* I: 10.5±2.8 C: 11.1±2.6 *HbA_{1c} (%)* I: 8.76±1.43 C: 8.82±1.24	I: Prepared meal plan group (n=56) had a low-fat dietary composition with macro-nutrients of carbohydrates/ fat/protein of 58/22/20 E%. The participants could choose from 40 prepared meals. The foods were delivered to their homes for free C: Usual care diet group (n=63) was prescribed a diet with the same macro-nutrient composition. The participants received mone-tary compensation for food purchases *Drop out rate at 1-year* I: 27% (15/56) C: 19% (12/63). Reasons were given	A 4-day food record at 0, 12, 26 and 52 weeks A repeated measures analysis of variance model was used	At 52-week follow-up, the intervention group had lost significantly more body weight –3.0±5.4 kg compared with the control group –1.0±3.8 kg ($p<0.001$). A weight loss of 5% or more was achieved by 29% of the intervention group and 10% of the control group ($p<0.03$). The intervention group also had a significantly greater reduction in HbA_{1c} (I: –0.24±1.52% and C: –0.20±1.30%; $p<0.02$) Some minor adverse reactions were reported (gastrointestinal complaints) in the study Adherence to the dietary inter-vention was reported at weeks 12, 26 and 52. The intervention group was more compliant and reduced the intake of fat (E%) and increased the intake of carbohydrates (E%) significantly more than the control group	High The relevance is questioned because the subjects did not have to pay for the food during the study period

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Franz 1995 [24] USA	RCT Procedure of randomisation not described Outpatient diabetes centers in 3 states Follow-up at 3 and 6 months	Type 2 diabetes patients, free of complications, referred by physicians or self-referred, and also recruited by local announcements (n=247). This paper reports results from 179 subjects 100 women/79 men Age: 56.4 (38–76) years BMI: 33 kg/m^2 (SD=6.6) HbA_{1c}: 8.3% (SD=1.9)	The intervention is built on nutrition recommendations from the American Diabetes Association (ADA) but diet is not described in the report. The difference between treatment groups is the intensity in nutrition therapy I1: Practice guidelines nutrition care (PCG) includes an initial session of 1 hour and 2 follow-up sessions I1: Basic nutrition care (BC) consisted of one visit At baseline (randomised): n=247 and at 6-month follow-up n=179 *Drop out rate:* At 6-month follow-up 28% (n=68)	No method described	Between baseline and 6-month follow-up, HbA_{1c} improved in the PCG group (mean difference –0.9%) as well as in the BC group (mean difference –0.7%). No difference between groups Significant weight loss in both groups (PCG –1.5 kg and BC –1.7 kg), but no difference between groups Total cholesterol dropped in the PCG group but not in the BC group No adverse reactions reported in the study Adherence to the intervention was not followed	Low Neither the randomisation nor the diet composition was described in detail. Adherence was not followed and the attrition rate was high

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Mayer-Davis 2004 [25] USA	RCT. Procedure of randomisation not described Two primary health care centers 3, 6, 12 months follow-up	Clinically verified type 2 diabetes (n=187), of whom 152 fulfilled the whole study 150 women/37 men Age: 60 years BMI: 36.7 kg/m^2 HbA_{1c}: 9.8%	Three diet intervention arms using the same message with a goal of 25 E% fat. Three levels of resources were tested I1: Intensive-lifestyle using individual counselling and a 16-session core curriculum I2: Reimbursable-lifestyle consisting of four 1-hour sessions C: Usual care consisting of one 1-hour session At baseline: n=187 and at 12-month follow-up n=152 *Drop out rate:* At 12-month follow-up 19% (n=35)	Not reported	Change in body weight (BW) was the primary outcome. At 6 but not 12 months BW significantly lower in I1 than C, but I2 not different from C In all groups lower HbA_{1c} at 6 months, but no difference between groups. No difference between groups in plasma lipids No adverse reactions reported in the study Adherence to the intervention was followed as proportion of attendees at sessions, but not as adherence to the food regimens	Low No description of randomisation or method of dietary measurement. Adherence to diet not reported

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA$_{1c}$/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Anderson-Loftin 2005 [26] USA	RCT using computer-generated table Diabetes education center in South Carolina 6 months	Afro-american type 2 diabetes patients, ≥18 years, with a BMI >25 and/or A_{1c} ≥8%, increased plasma lipids, high-fat dietary patterns (n=97 in total; to be sufficient based on power calculation) 73 women/24 men Age: 57.3 (32–86) years BMI: 34.7 kg/m^2 (18–57) A_{1c}: 7.9% (4.9–17.9)	Intervention focusing on lowering fat intake I: Using educational classes (4 weeks, 1.5 hours), thereafter peer-professional discussion group (1 session monthly for 4 months) and weekly telephone follow-ups C: Traditional diabetes class (in total 8 hours) At baseline: n=97 and at 6-month follow-up n=65 Drop out rate: At 6-month follow-up 33% (n=32)	Using the Kristal Food Habits Questionnaire (FHQ) to assess the intake of fat	A_{1c} or cholesterol showed no significant differences between groups. BMI decreased by 0.8 in intervention group and increased by 0.6 in control group (p=0.009). Dietary behaviour assessed by the FHQ showed a significant lowering in behaviour of fat intake in the intervention group compared with the control group (p=0.005) No adverse reactions reported in the study Adherence to the intervention was followed for fat intake behaviour (FHQ)	Low The study was conducted only on afro-american rural people. The study had a high attrition rate (33% at 6 months) and only fat intake in dietary evaluation

The table continues on the next page

Table 3.1.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Haimoto 2008 [27] Japan	Controlled but not randomised All type 2 diabetes outpatients, in Haimoto Clinic, Japan Follow-up after 2 years (last)	Individuals with type 2 diabetes. Excluded if having diabetes complications 70 women (53%)/ 63 men (47%) Age: CD (conventional diet) 69±11 years and CARD (carbohydrate-restricted diet) 64±8 years *BMI (kg/m^2):* CD 24.2±2.9 kg/m^2 CARD 25.1±3.4 *HbA_{1c} (%)* CD 7.1±1.0 CARD 7.4±1.1	Two dietary arms with composition of carbohydrate/fat/protein (%) I1: CD 57/26/16%, current recommendation for diabetes patients (n=57) I2: CARD 45/33/18%, elimination of carbohydrates (n=76) Drop out rate at 2 years: CD 0% and CARD 41% (n=6 in the first year and n=25 in the second year)	Food record for 3-days within 3 months from the end of the study. Carbohydrate intake lower and fat intake higher in the CARD than in the CD group	HbA_{1c} rose in the CD group from 7.1 to 7.5% and was reduced in the CARD group from 7.4 to 6.7% at 2 years of follow-up ($p<0.001$). Greater reduction in BMI in the CARD group. Mean total cholesterol and LDL cholesterol decreased in the CARD group but increased in the CD group Adherence to the diet was followed by the use of a 3-day food record. All CD but only 59% of the CARD participants followed their diets during the 2-year period	Low A controlled but not randomised study

BMI = Body mass index; C = Control group; CHO = Carbohydrates; FPG = Fasting plasma glucos; HDL = High density lipoprotein; I = Intervention group; kcal = Kilocalorie; MUFA = Monounsaturated fatty acid; n = Number; NS = Not significant; RCT = Randomised controlled trial; SD = Standard deviation

Table 3.1.8 *Observational studies on low-fat diet in patients with diabetes.*

First author Year Reference Country	**Study design Name of study Duration of follow-up**	**Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG**	**Intervention/exposure Number at baseline Drop outs due to death/other reasons Number at follow-up Number of outcome events**	**Method of dietary measurement Repeated measurements Confounders adjusted for**	**Results Effects/side effects Adherence to intervention**	**Study quality Comments**
Delahanty 2009 [12] USA	Cohort from DCCT, Observational study within a RCT	Type 1 diabetes 5 years follow-up n=532 52% women/48% men Age: 27.3+7 years BMI: 23.2+2.7 years kg/m^2 HbA_{1c}: 9.12+1.57%	All patients from the RCT that were followed for 5 years were at study end were included	Interview (Burke-type diet history) by dietician + food preparation questionnaires at entry, 2 and 5 years. Validation at average total calories at 2 and 5 years were used to calculate dietary composition. Data adjusted for potential confounders	HbA_{1c} inversely associated with carbohydrate intake (p=0.01) NS (p=0.2) if baseline HbA_{1c} and concurrent insulindose was corrected for Intake of saturated, monounsaturated, total fat directly associated with HbA_{1c} (p=0.002, 0.02, 0.004)	Moderate Not adjusted for socioeconomic factors
Trichopoulou 2006 [11] Greece	Prospective cohort (from EPIC). Follow-up 2–114 months (mean 4.5 years)	From the Greek EPIC cohort of 28 572 volunteers. n=1 013 Self reported diabetes treated with oral glucose lowering medication and/or insulin, no comorbidity. Duration of diabetes: 8.8 years 58% women/42% men Age <55 years: 15% *BMI* >30: 48%, <25: 13% HbA_{1c}: na	Drop outs not reported. Mortality = outcome measure. 5 deaths occurred during 1st year of follow-up	FFQ (150 items). Total kcal/day and nutrients in gram/day (adjusted for Greek food items) Singel measurement Adjustment for gender, educational level, smoking, waist-height, METscore, insulin-, hypertension-, lipid-lowering treatment, baseline dietary riskfactors	80 deaths, 46 cardiovascular Of all food items only egg consumption was positively correlated to all cause mortality: increase daily consumption by 10 gram (HR 1.54, 95% CI 1.2–1.97) Saturated fat (increment 10 gram) correlated with HR 1.82, 95% CI 1.14–2.9, p<0.01 and for cardiovascular mortality HR 1.93, 95% CI 1.08–3.42	Low Result for saturated fat not corrected for fibre intake. Few outcome events. Volunteers. No power analysis

The table continues on the next page

Table 3.1.8 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Tanasescu 2004 [9] USA	Type 2 diabetes Cohort from Nurses Health Study (NHS). Followed 1980–1998 (57 195 person years)	Type 2 diabetes n= 5 674, all women Type 2 diabetes self reported and subsequently confirmed in a validated questionnaire sent out every 2 years 1980–1996. Exclusion criteria: Baseline history of MI, angina, coronary revascularization revasc, stroke, or cancer. Age, BMI, HbA_{1c} or FPG not reported for the group as a whole	Reports of cardiovascular disease (CVD) was collected every 2 year and accrual of person months continued until 1998 or until the report of a CVD endpoint or death. 57 195 person years of follow-up. CVD events: 619 Non-fatal MI: 268 Fatal MI: 183 Strokes: 168	FFQ (61 food items in 1980 and thereafter 116 food items, validated with 1 week dietary records), repeated every 4 year. A cumulative average of nutrients and foods was made of all FFQ available at every 2 years follow-up. Confounders adjusted for: alcohol, smoking, family history of MI, vitamin supplements, dietary fibres, physical activity, diabetes medication, BMI, menopausal status	Total fat and subtypes of fat intake was presented in quintiles. After multivariate analyses with adjustment for fat subclasses and fibre intake, only cholesterol intake was significantly associated with CVD risk. Analyses of fat intakes as continous varibales showed also saturated fat to be significantly associated with CVD risk. P/S ratio and Keys score were significantly associated with fatal CVD events, but not with non-fatal events	Moderate FFQ few items. No adjustment for socioeconomy
Soinio 2003 [10] Finland	Prospective cohort. 7 years follow-up of type 2 diabetes patients from Turku and Kuopio	Type 2 diabetes n=661 45% women/55% men. Exclusion criteria: Previous history of MI or angina, type 1 diabetes. Age: 45–64 years BMI: (30 women/ 27 men 27,). FPG see results. HbA_{1c}: Not reported	Coronary heart disease (CHD) morbidity and mortality in relation to diet. n=661 at baseline. Drop out: 1 male refused to fill in FFQ. Outcome events = 117 deaths or non-fatal MI. Health questionnaire at end of study, review of medical record and death certificates	FFQ, report from the last month, 53 items. FFQ validated in subgroup of 34 (diet history and food record)	In women with compared to without CHD death a lower intake of total fat (39.3+5.7 vs 36.3+5.9 E%, p=0.016) and a higher intake of carbohydrates (43.2+5.9 vs 45.8+5.4 E%, p=0.033) was reported. NS for men. For men a weak association between low P/S ratio (<0.28) and CHD death rate was found. HR 2.45, 95% CI 1.01–5.93, p=0.048 (adjusted for age, diabetes-duration, total cholesterol, HDL-C, triglycerides, smoking, hypertension, BMI, FPG, area of residence, diabetes therapy)	Low Not adjusted for socioeconomic factors or fat subclasses

BMI = Body mass index; CI = Confidence interval; CVD = Cardiovascular disease; DCCT = Diabetes Control and Complications Trial; DM = Diabetes Mellitus; EPIC = European Prospective Investigation into Cancer and Nutrition; FFQ = Food Frequency Questionnaire; FPG = Fasting blood glucose; HR = Hazard ratio; HDL-C = High density lipoprotein cholesterol; IGT = Impaired glucoxtolerance; LOCF = Last observation carried forward; MI = Myocardial infarction; na = Not applicable; NS = Not significant; OGGT = Oral glucosetolerance test; Q4 = Fourth quartile; RCT = Randomised controlled trial

Table 3.2.2 *Low carbohydrate diets.*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Davis 2009 [9] USA	RCT. Not blinded. Primary care, private practice and hospital-based clinics Follow-up 12 months	105 overweight patients with type 2 diabetes. Control group (low fat, LF): n=55 (45 women/10 men). Low carb (LC) group: n=50 (37 women/13 men). Age: 54 years (SD±7 years) BMI 35 (C): 35±6kg/m^2 BMI 37 (LC): 35±6kg/m^2 <u>*Baseline data*</u> HbA_{1c}: 7,5/7,4% Total cholesterole: 4.4/4.3 mmol/L LDL-cholesterole: 2.5/2.4 mmol/L HDL-cholesterole: 1.3/1.2 mmol/L Triglycerides: 1.4/1.4 mmol/L. SBP/DBP: 125/73 vs 130/77 mm Hg. Metformin: 78/86% Sulfonylured: 44/52% Insulin: 35/24% Statins: 62/56%	Low carb diet modified after Atkins' model. Control low fat diet according to Diabetes Prevention Programme (DPP) All patients received recommendations to achieve 150 min and physical activity per week 81% of the participants completed the study. No difference in drop out rate between the 2 arms	24 hours recall at 6 and 12 months Patients kept daily food diaries, only used for assessment at 3 months	At 12 months there were no significant differences in caloric intake, percentage of saturated, polyunsaturated, monounsaturated fats or fibre. The energy intake (% of total energy) for carbohydrate/fat/protein was 33.4/43.9/22.7% for the LC-group and 50.1/30.8/18.9% for the LF-group. These differences between the groups were significant ($p<0.001$ for CHO and fat, $p<0.02$ for protein) Weight loss significantly faster with LC, but change from baseline was the same at 12 months (–3.1 kg; 3.4% weight reduction). HbA_{1c} LC –0.02±0.89% vs LF +0.24±1.4% (non significant). For the blood lipid variables HDL-cholesterol was 0.1 mmol/L higher in the LC-group ($p=0.002$), and no significant difference for the others. SBP/DBP did not differ significantly between the groups. Throughout the study there was an increase in caloric intake and macronutrients in both groups suggesting decreased adherence to the diets	Moderate

The table continues on the next page

Table 3.2.2 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Wolever 2008 Canada [10]	Multicenter RCT Not blinded to dieticians. Other blinding not stated Outpatients visiting 6 centra every 4 week Primary effect: HbA_{1c} Secondary effects: Blood glucose, lipids, CRP	Type 2 diabetes managed on diet alone With: HbA_{1c} ≤130% of "upper limit of normal" and BMI 24–40 kg/m^2 Without : Stroke, myocardial infarction, major surgery last 6 months, major disability, oral steroids, substance or alcohol abuse Age: 35–75 years 54% women/46% men	Exchange of diet items for choices of listed key foods High-GI diet: n=52 Drop outs: 21–31% Energy intake: 1 890±48 (SEM) kcal/day CHO: 46.5±0.9 E% GI: 63.2±0.4% HbA_{1c} at BL: 6.2±1.0% Low-GI diet: n=56 Drop outs: 20–32% Energy intake: 1 800±50 kcal/day CHO: 51.9±0.9 E% GI: 55.1±0.4% HbA_{1c} at BL: 6.2±0.8% Low-CHO diet: n=54 Drop outs: 19–24% Energy intake: 2 020±57 kcal/day CHO: 39.3±0.7 E% GI: 59.4±0.4% HbA_{1c} at BL: 6.1±0.9%	Daily key food records reviewed every 4 week by dietician 3-days food records at 1, 3, 6, 9, and 12 months Compositions assessed by in-house program and nutrient database	Primary end point: No effect of diet on HbA_{1c} Secondary end points: Plasma glucose 2-h post-OGTT (75 g) differed significantly between diets and interacted significantly with follow-up time. Lowest 12-month values in low-GI group At 12 months, fasting plasma glucose lowest in high-GI group Significant difference between diets (no time interaction) for HDL-cholestrol (low-GI lowest), triglycerides (low-carbohydrate lowest), apolipoprotein A_1 (low-GI lowest) CRP significantly lower after low-GI than after high-GI diet	Moderate study quality for primary end point Low study quality for secondary end points CRP unbalanced at baseline

BL = Baseline; BMI = Body mass index; CHO = Carbohydrate; CRP = C-reactive protein; DBP = Diastolic blood pressure; FPG = Fasting plasma glucose; GI = Glycemic index; HDL = High density lipoprotein; OGTT = Oral glucose tolerance test; RCT = Randomised controlled trial; SBP = Systolic blood pressure; SEM = Standard error of mean

Table 3.3.10 *Food and food patterns in persons with impaired glucose tolerance or impaired fasting glucose.*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Pan 1997 [1] China	RCT 110 660 inhabitants in the city of Da Qing screened for IGT and type 2 diabetes. Among those meeting WHO criteria för IGT, 577 patients agreed to diet intervention for 6 years	*Baseline characteristics (mean ± SD, n=530)* Age: 45.0±9.1 years 53% women/47% men BMI: 25.8±3.8 kg/m^2 FPG: 5.59±0.81 mmol/L	33 clinics randomized to intervention on their patients according to 4 protocols: 1) Diet (n=130): 55–65% CHO, 25–30% fat, 10–15% protein. Advice for caloric consumption and daily quantities of cereals, vegetables, meat, milk and oils 2) Exercise (n=141): Advice for increasing leisure physical exercise 3) Diet-plus-exercise (n=126): Counseling as in both groups 1) and 2) 4) Control (n=133): No individual group counseling. General information about diabetes, IGT, diet, and physical activity Of the initial 577 patients, 7 refused follow-up, 29 left Da Qing, 11 died	FFQ and interviews at baseline and thrice thereafter at 2-years intervals Compliance with the intervention regimen was discussed with nurses and clinical staff every 3 months	Cumulative incidence (%) of diabetes at 6 years in the 4 groups were: 43.8 (diet), 41.1 (exercise), 46.0 (diet-plus-exercise), and 67.7 (control) In a proportional hazards analysis adjusted for differences in baseline BMI and FPG, the interventions were associated with the following reductions in the risk of developing diabetes: 31% (diet; p<0.03), 46% (exercise, p<0.0005), and 42% (diet-plus-exercise, p<0.005) No demonstrable difference between control and intervention diets with regard to their % contents of CHO, fat, and protein, neither at baseline nor after 6 years	Low Because diets were poorly defined, no conclusion is warranted concerning specific components

The table continues on the next page

Table 3.3.10 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Lecomte 2007 [2] France	Prospective cohort study Patients discovered to have IFG (FPG 6.1–6.9 mmol/L) during health screening were followed up after 5 years	100% men *Mean values at baseline:* Age: 44.5 years BMI: 26.4 kg/m^2 FPG: 6.36 mmol/L	No intervention stated Among 4 532 men found to have IFG, 743 were re-examined 5 years later Drop outs were 2.7 years older than men followed up, but not different with regard to FPG, BMI, lipids or blood pressure at baseline	FFQ at baseline Models adjusted for age, BMI, TG, glucose	At follow-up, 17% of the men were diabetic, 39% had IFG, and 44% had normal FPG The strongest predictors for becoming diabetic were: family history (OR 4.2), FPG ≥6.7 mmol/L (OR 3.8), and BMI ≥25 kg/m^2 (OR 3.4) Among dietary factors, only no daily dairy products (OR 1.86) and low or moderate alcohol intake (OR 0.66) were significantly associated with diabetes after adjustment for family history, BMI, TG, and glucose at baseline High alcohol intake was significantly associated with diabetes after adjustment for BMI, TG, and glucose at baseline	Moderate Crude measure of alcohol intake (≤0.5 litre wine or beer per day and <4 cocktails/spirits per week) No analysis of any correlation between dairy products and alcohol. No correction for socioeconomic status. No power analysis

BMI = Body mass index; CHO = Carbohydrate; FFQ = Food Frequency Questionnaire; FPG = Fasting plasma glucose; IFG = Impaired fasting glucose; IGT = Impaired glucose tolerance; n = number; OR = Odds ratio; RCT = Randomised controlled trial; SD = Standard deviation; TG = Triglyceides

Table 3.3.11 *Food and food patterns in persons with diabetes (Intervention studies).*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Brehm 2009 [6] USA	RCT. ITT. Outpatients in research center. 1 year	Type 2 diabetes 78 women/46 men Not on insulin, lipid lowering drugs (other than statins), corticos-teroids or weight loss drugs BMI: 35.9±0.3 kg/m^2 Age: 56.5±0.8 years (range 38–78) HbA_{1c}: 7.3±0.1%	Two parallel groups with individual meal plans based on 200–300 kcal/day less than calculated daily caloric requirement *I (high-MUFA group)* Less starchy food, fruit and meat/meat substitutes, more fat (canola, olive, avocado), more beans, legumes and nuts *C (high-CHO group)* More starchy food, fruit and meat/meat substitutes, less fat, no beans or legumes or nuts n at baseline=124 Drop out: 26% (I: 31%, C: 16%)	3-day food record at baseline, 4, 8 and 12 months *Differences according to 3-day food records* I: More oil, nuts, seeds and olives. 38 E% fat (MUFA 14 E%), 46 E% CHO C: More low-fat products. 28 E% fat (MUFA 8 E%), 54 E% CHO PUFA higher in I than C. No difference for protein, saturated fat, or cholesterol (data not published). GI not calculated	*No difference between groups for any of the following parameters* Body weight HbA_{1c} HDL-C Blood pressure Fasting glucose Fasting insulin ANOVA (time^{x}treatment interaction) – data for differences not available No reported side-effects Adherence ratings reported to be similar for I and C	Low Randomisation technique and change in medications not described Larger drop out rate in high-MUFA group

The table continues on the next page

Table 3.3.11 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Esposito 2009 [3] Italy	RCT. Single center, teaching hospital, out patients 4 years	Newly diagnosed type 2 diabetes 50% women/50% men Age: 52±11 years BW: 86±10 kg BMI: 30±3.5 kg/m^2 HbA_{1c}: 7.7±0.9% FPG: 8.9±1.9 mmol/L	*1) Mediterranean-style diet (MED)* Vegetables, whole grain, poultry, fish. Low in red meat. CHO: ≤50 E% Fat: ≥30 E%, 30–50 g olive oil. Energy intake: ≤1 800 kcal for men, ≤1 500vkcal for women. n=108 at baseline. 10 drop outs in 4 years *2) Low-fat diet (LF), based on American Heart Association guidelines* Whole grain. Restricted additional fat, sweets, high-fat snacks. Fat: ≤30 E%, SF ≤10 E%, Energy intake: ≤1 800 kcal for men, ≤1 500 kcal for women. n=107 at baseline. 10 drop outs in 4 years	Diet diaries after instruction. Reviewed by nutritionist/ dietician monthly (first year) or bimonthly	*Primary trial outcome* = number of patients on anti-hyperglycemic drug therapy (HbA_{1c} >7%) after 4 years: MED: 44%, LF: 70% (p<0.001) *Secondary trial outcomes* Change after 4 years, difference MED–LF, 95% CI HbA_{1c}: –0.9 to –0.1% PG: –1.6 to –0.2 mmol/L HDL cholesterol: 0.02 to 0.14 mmol/L TG: –0.36 to –0.02 mmol/L Total cholesterol, systolic and diastolic blood pressure not significantly different between MED and LF diets Total energy intake, kcal/day: –109 to 35	Moderate Intense and frequent diet information Compliance with diet not reported. Results adjusted for BW but not for energy intake

The table continues on the next page

Table 3.3.11 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Giacco 2000 [9] Italy	RCT. ITT. Outpatients in research center 24 weeks (6 months), including 4-week run-in on baseline diet	Type 1 diabetes 21 women/33 men BMI: 23.9±0.6 kg/m^2 Age: 28.2±9.5 years On insulin, ≥2 injections/day. No renal failure, liver disease or symptomatic CHD. Mean diabetes duration 10.3±6.3 years HbA_{1c}: 8.8±1.4%	Two parallel groups with differing meal prescriptions *I (high-fibre group)* Fibre 50 g, GI 70. Food advice: 1 serving legumes/day, 3 servings high-fibre fruit/day, 2 servings high-fibre vegetables/day *C (low-fibre group)* Fibre 15 g, GI 90. Food advice: Limit consumption of food groups above (I). Choose fibre depleted fruits and vegetables, including fruit juice Diets designed to be weight-maintaining and identical in macronutrients 63 patients at baseline 9 drop outs (I: 9%, C: 19%) Non-compliant: n=8 Efficacy study: n=46	7-day food record at baseline and each month prior to visit with study dietitian *Criteria for poor compliance* High-fibre group Fibre: <30 g/day CHO: <45 E% Low-fibre group Fibre: >20 g/day CHO: <45 E%	*1) ITT analysis* Significant less hypoglycemic events (per patient per month) in I (0.73±0.7) than in C (1.5±1.2) No difference for HbA_{1c} (8.8±1.0 vs 9.1±1.3%) BW, total-C, HDL-C, TG, insulin dose *2) Efficacy analysis based on 75 and 71% of the patients in I vs C, respectively* Significant less hypoglycemic events in I (0.8±0.7) than in C (1.7±1.2) Significant lower HbA_{1c} in I (8.6±0.9%) than in C (9.1±1.4%). No difference for BW, total-C, HDL-C, TG, insulin dose Both ITT and efficacy analysis showed significant reductions in 8 hours glucose (day profile), supporting improved control of glycemia	Low Small trial with power to detect difference in HbA_{1c} of 0.5 units (%) Randomisation, medication (acarbose), and compliance not well described

The table continues on the next page

Table 3.3.11 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Houtsmuller 1980 [7] The Nether-lands	RCT Outpatients followed for 5 years	Newly diagnosed type 2 diabetes At baseline: n=102; after 5 years n=96 46% women/54% men At baseline, mild retinopathy in 25% of patients Age, BMI, HbA_{1c}, FPG not stated	102 patients matched in pairs for age, sex, BW, retino-pathy, GTT, serum insulin, lipids, heredity, smoking, and therapy, and randomised into two diet treatment groups (E%) 1) 50 CHO, 35 SF, 15 protein 2) 45 CHO, 40 fat (1/3 linoleic acid), 15 protein 4 times more linoleic acid in diet 2 than in diet 1 50 "normal subjects" as controls 2 men + 1 female on diet 1 died; 3 other drop outs not specified	S-cholesteryl lineoleate measured every 3 month	*Microangiopathy* Significantly ($p<0.001$) less retinopathy on diet 2 (32% of women; 27% of men) than on diet 1 (55% of women, 62% of men) Strong inverse correlation between progression of retinopathy and S-chole-steryl linoleate *Macroangiopathy* Significantly ($p<0.025$) less cardiac ischemia on diet 2 (2 women, 3 men) than on diet 1 (7 women, 11 men) *GTT and S-insulin* No difference between diets in men. Improved GTT and S-insulin on diet 2 in women	Low Recruitment and basal characteristics of patients poorly described. Diets poorly described

The table continues on the next page

Table 3.3.11 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Howard-Williams 1985 [8] United Kingdom	RCT Outpatients at Radcliffe Infirmary Diabetic Clinic 6–8 years follow-up	1973–1976: 250 patients at baseline 1982: 149 patients reviewed for retinopathy, 1 not reviewable because of cataract, 100 not attending *Baseline characteristics of 149 reviewed patients* Age: 57.8±0.8 years 55% men BMI: 27.7± 0.5 FPG: 11.8±0.33 mmol/L Without retinopathy at diagnosis: n=136 Baseline data not stated for diet treatment groups separately	Patients randomised to two groups *Low-CHO* 1 500 kcal/day, 40% CHO, 20% protein, 28% SF + MUFA, 12% PUFA, P/S fat ratio: 0.5 *Modified-fat* 1 500 kcal/day, 54% CHO, 20% protein, 10% SF + MUFA, 16% PUFA, P/S fat ratio: 1.7 After 6–8 years there were 79 pat on low-CHO and 70 on modified-fat. Drop out rate approximately 40%. Compared with reviewed patients, non-attenders were younger with higher BMI and longer symptom history	Interview by dietician Measurement of fatty acid composition in blood	Patients divided into compliers and non-compliers depending on dietician's judgement upon interview. Modified-fat compliers tended to have retinopathy less often than low-CHO compliers or non-compliers (not significant) Poorly controlled patients (HbA_{1c} >8%) with cholesterol ester linoleate <50% had a greater frequency of retinopathy than other patients. In better controlled patients (HbA_{1c} <8%), linoleic acid did not to influence the frequency of retinopathy	Low Randomisation procedure poorly described. High drop out rate. Food registration by interview only

The table continues on the next page

Table 3.3.11 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Jenkins 2008 [4] Canada	RCT ITT Patients and intervening dieticians not blinded. Technical analytical staff blinded. Outpatients, observed 7 times at specialist center during follow-up for 6 months	Type 2 diabetes with 6.5–8.0% HbA_{1c} at baseline; not on acarbose; free from clinically significant cardiovascular, renal, or liver disease; not on treatment for cancer 39% women/41% men in both treatment groups (high-cereal fibre and low-GI) Age and BMI (mean ± SD) in the two groups: 61±9 and 60±10 years; 31.2±5.8 and 30.6±6.0kg/m^2	Parallel groups with specified meal schemes *High-cereal fibre diet* Emphasizing whole grain, brown rice, potatoes with skins, tropical fruits. n=104 at baseline, 28% total drop out after randomisation, 23% after commencing treatment *Low-GI* Emphasizing low-GI bread and cereals, pasta, parboiled rice, beans, lentils, nuts, temperate fruits. n=106 at baseline, 25% total drop out after randomisation, 19% after commencing treatment	7-days diet records completed by patients Records repeated before each of 7 center visits Diets assessed for macronutrients, fatty acids, cholesterol, fibre, and GI by computer program based on US Dept of Agriculture data and international GI tables 11% in the low-GI group and 14% in the high-cereal fibre group estimated as poor adherents to diets	*HbA_{1c}* ($p<0.001$) and *fasting glucose* ($p<0.02$) decreased more in low-GI (–0.50% absolute. units; –11.1 mg/dL) than in high-cereal fibre (–0.18%; –4.4 mg/dL) group. The HbA_{1c} decrease in low-GI remained after controlling for BW ($p=0.002$), fibre ($p<0.001$), or CHO ($p<0.001$) *HDL-C* increased 1.7 mg/dl in low-GI and decreased –0.2 mg/dl in high-cereal fibre group ($p=0.005$ for difference between groups) *C-reactive protein* decreased –1.6 mg/L ($p=0.02$) in low-GI group, not significantly different from that in high-cereal fibre group No treatment difference between groups for total cholesterol, LDL-C, TG, blood pressure, BW. No serious adverse effects. Hypoglycemia in 6 low-GI patients	Moderate Randomisation technique not well described

The table continues on the next page

Table 3.3.11 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Wolever 2008 [5] Canada	Multicenter RCT Not blinded to dieticians. Other blinding not stated. Outpatients visiting 6 centers every 4 week Primary effect: HbA_{1c} Secondary effects: blood glucose, lipids, CRP	Type 2 diabetes managed on diet alone With: HbA_{1c} ≤130% of "upper limit of normal" and BMI 24–40 kg/m^2 Without : stroke, myocardial infarction, major surgery last 6 months, major disability, oral steroids, substance or alcohol abuse Age: 35–75 years 54% women/46% men	Exchange of diet items for choices of listed key foods <u>*High-GI diet (n=52)*</u> Drop outs: 21–31% Energy intake: 1 890±48 (SEM) kcal/day CHO: 46.5±0.9 E% GI: 63.2±0.4% HbA_{1c} at baseline: 6.2±1.0% <u>*Low-GI diet (n=56)*</u> Drop outs: 20–32% Energy intake: (SEM) 1 800±50 kcal/day CHO: 51.9±0.9 E% GI: 55.1±0.4% HbA_{1c} at baseline: 6.2±0.8% <u>*Low-CHO diet (n=54)*</u> Drop outs: 19–24% Energy intake: (SEM) 2 020±57 kcal/day CHO: 39.3±0.7 E% GI: 59.4±0.4% HbA_{1c} at baseline: 6.1±0.9%	Daily key food records reviewed every 4 week by dietician 3-day food records at 1, 3, 6, 9, and 12 months Compositions assessed by in-house program and nutrient database	<u>*Primary effect*</u> No effect of diet on HbA_{1c} <u>*Secondary effects*</u> Plasma glucose 2-hour post-OGTT (75 g) differed significantly between diets and interacted significantly with follow-up time. Lowest 12-month values in low-GI group At 12 months, FPG lowest in high-GI group Significant difference between diets (no time interaction) for HDL-C (low-GI lowest), TG (low-CHO lowest), apolipoprotein A1 (low-GI lowest) CRP significantly lower after low-GI than after high-GI diet	Moderate study quality for primary end point Low study quality for secondary end points Moderate HbA_{1c} values already at baseline CRP unbalanced at baseline

ANOVA = Analysis of variance; BMI = Body mass index; BW = Body weight; C = Control; CHD = Coronary heart disease; CHO = Carbohydrate; CI = Confidence interval; CRP = C-reactive protein; tFPG = Fasting plasma glucose; GI = Glycemic index; GTT = Glucose tolerance test; HDL-C = High density lipoprotein; I = Intervention; IFG = Impaired fasting glucose; ITT = Intention-to-treat; LDL-C = Low density lipoprotein; LF = Low fat; MED = Mediterranean diet; MUFA = Monounsaturated fatty acids; OGTT = Oral glucose tolerance test; PG = Plasma glucose; PUFA = Polyunsaturated fatty acids; RCT = Randomised controlled trial; SEM = Standard of mean; SF = Saturated fatty acids; TG = Triglycerids

Table 3.3.12 *Food and food patterns in persons with diabetes (observation studies).*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Hu 2003 [10] USA	Prospective cohort study *End points* CHD incidence and all-cause mortality 1980–1996 Subcohort of Nurses' Health Study; recruited during 1976–1994 16 years follow-up	Type 2 diabetes; only women Age, BMI, HbA_{1c}, FPG not stated for complete cohort *For 1 097 patients recruited in 1980* Mean age: 48 years Mean BMI: 28,1 kg/m^2	Food ad libitum. Cohort (5 103 women at baseline) divided in 5 groups reflecting intake of fish or ω-3 FA. Group sizes given in person-years (py), not number of patients. Drop out rate not stated *Fish <1/month* 41 CHD/3 170 py 48 deaths/3 209 py *Fish 1–3/months* 92 CHD/11 685 py 114 deaths/11 784 py *Fish 1/week* 161 CHD/21 705 py 219 deaths/21 837 py *Fish 2–4/week* 52 CHD/6 495 py 60 deaths/6 554 py *Fish >5/week* 16 CHD/2 790 py 27 deaths/2 808 py	Repeated food questionnaires 1980, 1984, 1986, 1990, 1994. Daily intake of nutrients calculated from frequency and content of each item, and totaling over items Intake of long-chain ω-3 FA computed with a view to fish species differences Computed ω-3 intake correlated with EPA in adipose tissue Adjustments for several life style, dietary and clinical variables	RR (95% CI) of CHD or death compared with: "Fish <1/week" or "ω-3, 0.04 g/day", and adjusted for age, smoking, life-style and dietary risk factors Fish 1–3/months CHD: 0.70 (0.48–1.03) Death: 0.75 (0.53–1.07) Fish 1/week CHD: 0.60 (0.42–0.85) Death: 0.66 (0.48–0.92) Fish 2–4/week CHD: 0.64 (0.42–0.99) Death: 0.67 (0.45–1.01) Fish >5/week CHD: 0.36 (0.20–0.66) Death: 0.48 (0.29–0.80) Trend in fish intake data: p=0.002 (CHD) or 0.005 (death)	High Fish and ω-3 intake groups unbalanced in many variables. Residual confounding not excluded ω-3 data reported in a separate table below

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Hu 2003 [10] USA (Continued)	Prospective cohort study *End points* CHD incidence and all-cause mortality 1980–1996 Subcohort of Nurses' Health Study; recruited during 1976–1994 16 years follow-up	Type 2 diabetes; only women Age, BMI, HbA_{1c}, FPG not stated for complete cohort *For 1 097 patients recruited in 1980* Mean age: 48 years Mean BMI: 28.1 kg/m^2	Food ad libitum. Cohort (5 103 women at baseline) divided in 5 groups reflecting intake of fish or ω-3 FA. Group sizes given in person-years (py), not number of patients. Drop out rate not stated *ω-3, 0.04 (median) g/day* 56 CHD/7 421 py 77 deaths/7 475 py *ω-3, 0.06 g/day* 113 CHD/11 822 py 131 deaths/11 924 py *ω-3, 0.09 g/day* 77 CHD/10 334 py 101 deaths/10 420 py *ω-3, 0.15 g/day* 67 CHD/8 462 py 87 deaths/8 515 py *ω-3, 0.25 g/day* 49 CHD/7 806 py 72 deaths/7 857 py	Repeated food questionnaires 1980, 1984, 1986, 1990, 1994. Daily intake of nutrients calculated from frequency and content of each item, and totaling over items Intake of long-chain ω-3 FA computed with a view to fish species differences Computed ω-3 intake correlated with EPA in adipose tissue Adjustments for several life style, dietary and clinical variables	RR (95 % CI) of CHD or death compared with: "Fish <1/week" or "ω-3, 0.04 g/day", and adjusted for age, smoking, life-style and dietary risk factors ω-3, 0.06 g/day CHD: 0.96 (0.71–1.31) Death: 0.77 (0.58–1.00) ω-3, 0.09 g/day CHD: 0.85 (0.60–1.20) Death: 0.76 (0.56–1.02) ω-3, 0.15 g/day CHD: 0.92 (0.66–1.30) Death: 0.77 (0.57–1.05) ω-3, 0.25 g/day CHD: 0.69 (0.47–1.03) Death: 0.63 (0.45–0.88) Trend in ω-3 intake data: p=0.10 (CHD) or 0.02 (death)	High Fish and ω-3 intake groups unbalanced in many variables. Residual confounding not excluded Fish data reported in a separate table above

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Kalkwarf 2001 [13] USA	Prospective cohort study The Diabetes in Pregnancy Program	Pregnant women with type 1 diabetes. Age: 26±5 years Pre-pregnancy BMI: 23±4kg/m^2 HbA_{1c}: 8.6% FPG: 6.8 mmol/L Mean gestation lenght at enrollment: 9.1±5.3 weeks At time of diagnosis 49% had hypertension, 21% renal disease, 13% eye disease, and 9% were on thyroid medication	No intervention. Self-sected exposure to total, water soluble and insoluble fibre n=97–141, depending on variables studied No drop outs No outcome events Outcome measures: Insulin dose, pre-meal glucose, HbA_{1c}	3-day food record 69 women provided one food record each trimester (in total 3). 72 women provided at least 1 food record during pregnancy Adjustments for total energy and CHO intake, BW, renal and thyroid disease, disease duration, renal disease, type of insulin, year of study	Negative correlation between insulin dose and water soluble fibre in *1) Unadjusted statistical model* r= –0.22 (p=0.02) in 2nd trimester r= –0.21 (p=0.07) in 3rd trimester *2) Model adjusted for confounders* r= –0.21 (p=0.03) in 2nd tri-mester; r= –0.08 (p=0.48) in 3rd trimester In 2nd and 3rd trimesters, insulin requirements asso-ciated with a high total fibre intake (20.5 g/day) were 16–18% lower than for a low fibre intake (8.1 g/day). Pre-meal blood glucose and HbA_{1c} were not associated with fibre intake	Low Potential confounders such as smoking and physical activity not considered Suboptimal precision in estimation and timing of correlated data

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Li 2009 [12] USA	Prospective cohort study *End points* Total CVD and MI alone Subcohort of Nurses' Health Study; recruited during 1980–2002	Type 2 diabetic women without CVD or cancer at entry Mean age: 57 years Mean BMI: 29.8 kg/m^2	Food ad libitum. Cohort of 6 309 patients divided in 4 groups reflecting frequency of servings of nuts or peanut butter (1 serving=16 g of nuts or 28 g of peanut butter): *Almost never* 613 *1–3 servings/month to 1 serving/week* 2 275 *2–4 servings/week* 2 725 *≥5 servings/week* 696	Repeated food questionnaires 1980, 1984, 1986, 1990, 1994, 1998 Adjustments for several life style, dietary and clinical variables	634 cases of CVD RR (95% CI) of total CVD or MI alone compared with: "Almost never" and adjusted for age, BMI, physical activity, alcohol consumption, family history of MI, hormone use and menopausal status, smoking, aspirin intake, duration of diabetes, hypertension, hypercholesterolemia, total energy intake, cereal fibre, glycemic load, saturated fat, and trans fat 1–3 servings/month to 1 serving/week CVD: 0.72 (0.50, –1.02) MI: 0.63 (0.41, –0.96) 2–4 servings/week CVD: 0.80 (0.48, –0.95) MI: 0.74 (0.49, –1.13) ≥5 servings/week CVD: 0.56 (0.36, –0.89) MI: 0.56 (0.33, –0.97) In a subgroup of 1 171 patients nut and peanut butter intake correlated with several blood lipid variables, but not with inflammatory markers	Moderate Mortality and stroke data not explicitly reported. Groups unbalanced in many variables at baseline. No significant trend across groups after multivariat adjustment

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Nöthlings 2008 [11] 10 European countries	Prospective cohort study EPIC Mean 9 years follow-up (range <1 to >14 years)	Mixed type 1 diabetes and type 2 diabetes subcohort (n=10 449) of EPIC 54% women/46% men Mean age at baseline: 58 years Mean BMI at baseline: 28.8	Food intake ad libitum. Cohort divided in quartiles of self-reported consumption of vegetables, legumes and fruit Total n=10 449 at baseline. Number of drop outs not stated <u>*Deaths*</u> 1 346 all causes 517 circulatory disease 319 cancer 323 other specific causes 187 unknown cause Total number at baseline used for RR of all-causes deaths. n=10 262 for RR of deaths from specific causes	Dietary intake during 12 months before baseline by questionnaire, in part combined with food records 24-hour dietary recall for 8% of cohort, used for calibrating questionnaire data No other repeated measurement	<u>*All-cause mortality*</u> 1) Inversely related to intake of total vegetables, legumes and fruit. An intake increment by 80 g/day yielded RR=0.95 in men (95% CI 0.89–1.00), 0.93 in women (95% CI 0.85–1.03), 0.94 in all patients (0.90–0.98), and 0.95 (95% CI 0.90–1.00) in 8 408 patients diagnosed as diabetics at 40 years or older (type 2 diabetes subcohort) 2) Inversely related to vegetables ($p<0.03$) or legumes ($p<0.02$) alone 3) Not significantly related to fruit alone <u>*CVD mortality, non-CVD/ non-cancer mortality,*</u> but not cancer mortality, significantly inversely related to intake of total vegetables, legumes and fruit Adherence to baseline dietary pattern not ascertained	Moderate Diet groups unbalanced in many variables at baseline (e g insulin treatment, heart attacks, hypertension, hyperlipidemia)

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Soinio 2003 [14] Finland	Prospective cohort study Type 2 diabetes 7 year follow-up of patients from Turku and Kuopio	n=661 295 women/366 men Without history of MI or angina Age: 45–64 years *Mean BMI:* Women: 31 kg/m^2 Men: 28 kg/m^2	Dietary habits assessed by FFQ and related to coronary heart disease and mortality 117 deaths or non-fatal MI	FFQ, validated against diet history and food record	For men, but not women, the lipid P/S-ratio was associated with CHD death and all CHD events	Low Food intake only registered at baseline. Study not designed with respect to MUFA. Statistical correction for combining data from regions with different pattern of confounders
Tanasescu 2004 [15] USA	Prospective cohort study End points: Total CVD, fatal CHD, nonfatal MI, stroke Subcohort of Nurses' Health Study; recruited during 1980–1996 16 years follow-up	Type 2 diabetes; only women Age, BMI, HbA_{1c}, FPG not stated for complete cohort *For 1 692 patients in 1980* Mean age: Approximately 48 years Mean BMI: Approximately 28 kg/m^2	Food ad libitum. The association of end points with intake of various fat types in 5 672 women studied in statistical models representing intakes as quintiles or as continuous variables Drop out rate not stated In total 619 CVD events including 268 nonfatal MI, 183 fatal MI, 168 strokes	Intake of total and specific types of fat calculated from repeated food questionnaires in 1980, 1984, 1986, 1990, and 1994 Adjustments for many life style, dietary and clinical variables	*CVD risk* 1) Not associated with total fat intake or intake of poly-unsaturated fat in continuous variable or quintile models 2) Not associated with intake of MUFA in quintiles model 3) Almost significantly associated with intake of MUFA in continuous variable model (p=0.10) 4) Almost significantly associated with P/S-ratio in both continuous variable (p=0.10) and quintiles (p=0.11) model Replacing 5% energy from SF with MUFA calculated to be associated with 22% reduction of CVD risk (p=0.048)	Low Diet groups unbalanced at baseline. Complex models, weak statistical significance

The table continues on the next page

Table 3.3.12 *continued*

First author Year Reference Country	Study design Name of study Duration of follow-up	Population/Patient characteristics at baseline Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Intervention/exposure Number at baseline Drop outs due to death/ other reasons Number at follow-up Number of outcome events	Method of dietary measurement Repeated measurements Confounders adjusted for	Results Effects/side effects Adherence to intervention	Study quality Comments
Trichopoulou 2006 [16] Greece	Prospective cohort study EPIC Mean follow-up: 4.5 years (range 2–114 months); 4 579 person-years	Mixed type 1 diabetes and type 2 diabetes subcohort of EPIC, identified by use of drugs (815 oral, 198 insulin), free of cancer and CVD at baseline 589 women/424 men *Age* <55 years: 155 55–64 years: 326 65–74 years: 475 ≥75 years: 57 *BMI* <25: 128 25 to 30: 402 ≥30: 483	No intervention 1 013 patients at baseline *Deaths during follow-up* 46 CVD 19 cancer 15 other causes 80 all causes	FFQ at baseline Multivariate models adjusted for many life-stile, anthropo-metric, medical, and dietary variables	Among 16 different dietary variables, intake of saturated fat or eggs was significantly associated with all-causes death and, more strongly, cardiovascular death Depending on the details of statistical modelling, incon-sistent results were reported for intake of cereals (possibly decreased mortality) and PUFA (possibly increased mortality)	Low Dietary measurement only at baseline and by FFQ only Relatively few deaths, no power analysis

BMI = Body mass index; BW: Body weight; CI = Confidence interval; CHD = Coronary heart disease; CHO = Carbohydrate; CVD = Cardiovascular disease; EPA = Eicosapenta-enoic acid; FA = Fatty acids; FFQ = Food Frequency Questionnaire; FPG = Fasting blood glucose; EPIC = European prospective investigation into cancer and nutrition; MI = Myo-cardial infarction; MUFA = Monounsaturated fatty acids; n = number; py = Person-years; r = correlation coefficient; RR = Relative risk; SF = Saturated fat; ω-3 FA = Omega-3-fatty acids

Table 3.4.5 *Observational studies of alcohol consumption in persons with impaired glucose tolerance or impaired fasting glucose.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Lecomte 2007 [4] France	Prospective cohort study Participants recruited from medical check-ups provided by the French social security system Follow-up 5 years	IFG (FPG 6.1–6.9 mmol/L) Men only (743) Mean age: 45 years (range 20–60 years) Mean BMI: 26.4 kg/m^2	n=743 at baseline *Alcohol* No alcohol intake: 84 Low/moderate: 416 High: 243 *Dairy products* No daily intake of dairy products: 284 Daily intake of dairy products: 559 Only men with a second health exam included (743 out of 4 532) 127 developing diabetes	Nutritional questionnaire (one occasion) Adjustment for family history of diabetes, BMI, triglycerides and glucose at baseline	*OR for being a person with diabetes at end of follow-up* No alcohol: 1.2 (0.6–2.1) Low/moderate: 0.6 (0.4–0.9) High: 1.5 (1.0–2.3) No diary products: 1.7 (1.2–2.6)	Low Imprecise outcome data Adjustment missing for several important prognostic variables
de Vegt 2002 [5] The Netherlands	Prospective cohort study Population-based Mean follow-up 7.6 years	IFG (FPG 6.1–7.0 mmol/L) and IGT (glucose 7.8–11.1 mmol/L 2 hours postload) Age: 50–75 years Approximately 45% men BMI not given	n=2 393 at baseline No alcohol intake: 244 (mostly women) 0.1–9.9 g/day: 206 ≥10 g/day: 209 Number developing diabetes not given (overall around 10%)	Validated semi-quantitative FFQ Adjustment for age and sex	*RR for being a person with diabetes at end of follow-up* No alcohol: 1.56 (0.99–2.48) 0.1–9.9 g/day: 1.00 ≥10 g/day: 1.29 (0.80–2.06)	Low Imprecise outcome data Adjustment missing for several important prognostic variables

BMI = Body mass index; FFQ = Food Frequency Questionnaire; FPG = Fasting plasma glucose; IFG = Impaired fasting glucose; IGT = Impaired glucose tolerance; OR = Odds ratio; RR = Relative risk

Table 3.4.6 *Observational studies of coffee consumption in persons with impaired glucose tolerance or impaired fasting glucose.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Smith 2006 [6] USA	Modified nested (prospective) case-control design (The Rancho Bernardo Study) Follow-up 5–12 years	Population-based, people with IGT or impaired fasting glucose Women 58%/men 42% Mean age: 66 years Overweight: 37% Obese: 7% No information on metabolic control	n=910 at baseline 0 cups: 99 1–2 cups: 133 3–4 cups: 59 ≥5 cups: 26 Withdrawal/ drop outs: Specific information missing (approximately 40% of survivors in total study) Incident type 2 diabetes: 84	Questionnaire on coffee consumption (one occasion). Adjusted for age, sex, physical exercise, BMI, smoking, alcohol intake, hypertension, and fasting plasma glucose at baseline	*Incident type 2 diabetes* Current drinker vs never drank: OR 0.36 (0.16–0.83) 0 cups: OR 1.00 1–2 cups: OR 0.71 (0.35–1.41) 3–4 cups: OR 0.55 (0.22–1.36) ≥5 cups: OR 1.01 (0.33–3.13) No information on compliance	Moderate Imprecise outcome data No adjustment for socio-economic differences

FPG = Fasting plasma glucose; IGT = Impaired glucose tolerance; OR = Odds ratio

Table 3.4.7 *Observational studies of alcohol consumption in patients with diabetes.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Tanasescu 2001 [18] USA	Prospective cohort study (Health Professionals Follow-Up Study) Individuals with diabetes Mean follow-up approximately 5 years	Type 2 diabetes, free of CVD at baseline Men only Age: 40–75 years Mean BMI approximately 26. No information on metabolic control	n=2 419 at baseline No alcohol: 4.374 person-years 0–0.5 drinks/day: 3.549 person-years 0.5–2 drinks/day: 2.306 person-years >2 drinks/day: 1.182 person-years Loss to follow-up not reported. 150 CHD events	Validated FFQ Repeated measurements not reported Adjustment for smoking, BMI, physical activity, hypertension, high cholesterol, family history of myocardial infarction, duration of diabetes, dietary factors (including total energy intake)	*Total myocardial infarction* 0 drinks/day: RR 1.00 0–0.5 drinks/day: RR 0.78 (0.52–1.15) 0.5–2 drinks/day: RR 0.62 (0.38–1.00) >2 drinks/day: RR 0.48 (0.25–0.94) *Non-fatal CHD* 0 drinks/day: RR 1.00 0–0.5 drinks/day: RR 0.78 (0.46–1.33) 0.5–2 drinks/day: RR 0.66 (0.34–1.26) >2 drinks/day: RR 0.56 (0.22–1.41) *Fatal CHD* 0 drinks/d: RR 1.00 0–0.5 drinks/day: RR 0.79 (0.44–1.41) 0.5–2 drinks/day: RR 0.59 (0.29–1.21) >2 drinks/day: RR 0.45 (0.17–1.14)	Moderate Low number of events; imprecise measurements of outcomes. Differences in socioeconomic status assumed to be modest

The table continues on the next page

Table 3.4.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG	Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events	Method of dietary measurements Repeated measurements Confounders adjusted for	Results Effects/adverse effects Adherence to exposure	Study quality Comments
Valmadrid 1999 [16] USA	Prospective population-based cohort study (The Wisconsin Epidemiologic Study of Diabetic Retinopathy) Follow-up approximately 11 years	Type 2 diabetes Women: 55% Men: 45% Age mean: 69 years BMI mean: 29.1 kg/m^2 Mean glycosylated hemoglobin: 9.3%	n=983 at baseline Never drinkers: 107 Formers drinkers: 322 <2 g/day: 340 2–13 g/day: 117 14–28 g/day: 60 <28 g/day: 37 Withdrawal not reported 198 CHD deaths	Questionnaire on alcohol intake (one occasion). Adjustment for age, sex, smoking, insulin and digoxin use, glycosylated hemoglobin and C-peptide levels, history of myocardial infarction or angina, retinopathy	*Total mortality* Never drinkers: RR 1.00 Former drinkers: RR 0.69 (0.43–1.12) <2 g/day: RR 0.54 (0.33–0.90) 2–13 g/day: RR 0.44 (0.23–0.84) ≥14 g/day: RR 0.21 (0.09–0.48) *CHD mortality* Never drinkers: RR 1.00 Former drinkers: RR 0.81 (0.39–1.71) <2 g/day: RR 0.63 (0.29–1.39) 2–13 g/day: RR 0.23 (0.07–0.81) ≥14 g/day: RR 0.21 (0.06-0.73)	Moderate No adjustment for socioeconomic factors. Imprecise outcome data
Moss 1994 USA [22]	Prospective population-based cohort, recruitment by primary care physicians Mean follow-up 6 years	Type 1 and type 2 diabetes Sex distribution not given. Young-onset group age range 21–69 years (median approximately 32 years). Older-onset group age range 35–94 years (median approximately 67 years). BMI or metabolic control not given	n=917 at baseline Younger-onset group: 485 Older-onset group: 857 Alcohol intake classified into 4 groups. Withdrawal/drop outs: Younger-onset group: 46 (9%) Older-onset group: 379 (44%), mostly because of death. Approximately 130 incident cases of retinopathy. Approximately 340 cases of progression to retinopathy. Approximately 110 cases of progression to proliferative retino-pathy	Questionnaire at baseline. No repeated measurements. Adjustment for age, diabetes duration, glycosylated hemo-globin	*Incidence of retinopathy* Younger-onset group: OR 2.09 (0.04–1.07)* Older-onset group: OR 0.75 (0.40–1.42) *Progression of retinopathy* Younger onset group: OR 1.25 (0.75–2.08) Older-onset group: OR 0.73 (0.44–1.20) *Progression to proliferative retinopathy* Young-onset group: OR 0.72 (0.38–1.35) Older-onset group: OR 1.10 (0.36–3.41) * Upper CI limit given in the article must be incorrect	Low Imprecise outcome measures. Limited adjustment for confounders

The table continues on the next page

Table 3.4.7 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG	Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events	Method of dietary measurements Repeated measurements Confounders adjusted for	Results Effects/adverse effects Adherence to exposure	Study quality Comments
Diem 2003 [17] Schweiz	Prospective cohort study of randomly selected patients recuited from local practitioners Mean follow-up 12.6 years	Type 2 diabetes Men: 162 (56%) Women: 125 (44%) Mean age: 46.2 years Mean BMI: 27.6 kg/m^2 Mean FPG: 9.8–10.8 mmol/L	n=287 at baseline Daily alcohol intake classified into 4 groups Data on alcohol intake missing in 21 participants. Withdrawal not reported 70 deaths 21 CHD deaths	Questionnaire on alcohol intake at baseline No repeated measurements Adjustment for age, duration of diabetes, BMI, cholesterol levels, blood pressure, smoking	*Deaths from CHD* 0 g/day: RR 1.00 1–15 g/day: RR 0.87 (0.25–2.52) 16–30 g/day: RR 0.00 (0.00–0.92) >30 g/day: RR 0.37 (0.01–2.42) *Deaths from all causes* 0 g/day: RR 1.00 1–15 g/day: RR 1.27 (0.68–2.28) 16–30 g/day: RR 0.36 (0.09–0.99) >30 g/day: RR 1.66 (0.77–3.33)	Moderate No adjustment for socioeconomic status. Imprecise outcome data
Ajani 2000 [19] USA	Prospective cohort within an RCT (Physicians' Health Study); post-hoc analysis Mean follow-up 5.5 years	Diabetes type not given Men only (2 790) Mean age approximately 62 years Mean BMI: 26 kg/m^2 No information on metabolic control	n=2 790 at baseline *Frequency of alcohol intake classified into 4 categories* Rarely/never: 799 Monthly: 396 Weekly: 986 Daily: 609 No information on loss to follow-up 133 CHD–deaths in person with and 717 in persons without diabetes	Questionnaire on alcohol intake at baseline No repeated measurements Adjustment for age, smoking, physical activity, randomised treatment assignment in RCT, BMI, family history of myocardial infarction, angina, hypertension, high cholesterol	*CHD mortality* Rarely/never: RR 1.00 Monthly: RR 1.11 (0.66–1.89) Weekly: RR 0.67 (0.42–1.07) Daily: RR 0.42 (0.23–0.77) *Incident CHD* Rarely/never: RR 1.00 Monthly: RR 0.84 (0.46–1.54) Weekly: RR 0.75 (0.45–1.26) Daily: RR 0.66 (0.38–1.16)	High Differences in socio-economic status assumed to be modest

The table continues on the next page

Table 3.4.7 *continued*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA$_{1c}$/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Solomon 2000 [20] USA	Prospective cohort study (Nurses' Health Study). Mean follow-up 7.7 years	Type 2 diabetes Women only (5 103) Mean age approximately 48 years (range 30–55 years). Mean BMI approximately 28 (higher when alcohol intake was 0). No information on metabolic control	n=5 103 at baseline Alcohol intake classified into 3 groups None: 22 715 person-years 0.1–4.9 g/day: 10 326 person-years ≥5 g/day: 6 051 person-years No information on loss to follow-up 295 CHD events (194 nonfatal, 101 fatal)	FFQ Biannual measurements. Adjustment for age, time period, BMI, smoking, family history of myocardial infarction, hypertension, high cholesterol, menopause, postmenopausal hormone replacement, use of aspirin, multivitamins and vitamin E, physical activity	<u>*Total CHD*</u> None: RR 1.00 0.1–4.9 g/day: RR 0.72 (0.54–0.96) <u>*Nonfatal CHD*</u> None: RR 1.00 0.1–4.9 g/day: RR 0.79 (0.56–1.12) ≥5 g/day: RR 0.47 (0.28–0.79) <u>*Fatal CHD*</u> None: RR 1.00 0.1–4.9 g/day: RR 0.60 (0.36–1.01) ≥5 g/day: RR 0.43 (0.21–0.88) Effects present in all subgroups (tobacco, BMI, hypertension, family history of MI)	High Differences in socio-economic status assumed to be modest
Young 1984 [23] United Kingdom	Prospective cohort study of randomly selected patients with diabetes Follow-up 3 years 8 months to 6 years 2 months (mean 4 years 8 months)	Type 1 and type 2 diabetes Men only (403) Age: 20–59 years BMI: not given Approximately 15% with "clinic blood glucose" >9 mmol/L	n=296 at baseline Alcohol intake classified into 2 groups: a. ≤5.7 L per week (or equivalent) (76%) b. >5.7 L per week (or equivalent) (24%) 63 dead during follow-up 75 drop outs for other reasons 66 incident cases of retinopathy	Alcohol data by interview No repeated measurements reported Adjustment for duration of diabetes, glycemic control, sexual function, proteinuria	<u>*Development of retinopathy (assessed by ophtalmoscopy)*</u> Low alcohol: 20% High alcohol: 30% p=0.02 (multiple adjustments for co-variates)	Low Important prognostic variables missing in the adjustments. Validity of alcohol exposure uncertain

BMI = Body mass index; CHD = Coronary heart disease; CI = Confidence interval; CVD = Cardiovascular disease; FFQ = Food Frequency Questionnaire; FPG = Fasting plasma glucose; MI = Myocardial infurction; OR = Odds ratio; RCT = Randomised controlled trial; RR = Relative risk

Table 3.4.8 *Observational studies of coffee consumption in patients with diabetes.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Bidel 2006 [24] Finland	Prospective cohort study Individuals with diabetes within six randomly selected cohorts Mean follow-up 20.8 years	Type 2 diabetes 38–59% women in different coffee consumtion groups Mean age: 38–57 years in different coffee consumption groups Mean BMI: 29.8 kg/m^2 No information on metabolic control	n=3 837 at baseline 0–2 cups/day: 644 3–4 cups/day: 1 041 5–6 cups/day: 1 356 ≥7 cups/day: 796 None lost to follow-up 1 471 deaths 598 CHD deaths 210 stroke deaths	Questionnaire at baseline No repeated measurements Adjustment for age, sex, study year, BMI, blood pressure, total cholesterol, education, alcohol and tea consumption, smoking status	*Total mortality* 0–2 cups: HR 1.00 3–4 cups: HR 0.77 (0.65–0.91) 5–6 cups: HR 0.68 (0.58–0.85) ≥7 cups: HR 0.70 (0.59–0.95) *CVD mortality* 0–2 cups: HR 1.00 3–4 cups: HR 0.79 (0.64–0.97) 5–6 cups: HR 0.70 (0.57–0.86) ≥7 cups: HR 0.71 (0.56–0.90) *CHD mortality* 0–2 cups: HR 1.00 3–4 cups: HR 0.78 (0.60–1.01) 5–6 cups: HR 0.70 (0.54–0.90) ≥7 cups: HR 0.63 (0.47–0.84) *Stroke mortality* 0–2 cups: HR 1.00 3–4 cups: HR 0.77 (0.50–1.19) 5–6 cups: HR 0.64 (0.41–0.99) ≥7 cups: HR 0.90 (0.56–1.45)	Moderate Uncertain adherence to exposure during long follow-up

The table continues on the next page

Table 3.4.8 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG	Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events	Method of dietary measurements Repeated measurements Confounders adjusted for	Results Effects/adverse effects Adherence to exposure	Study quality Comments
Zhang 2009 [25] USA	Prospective cohort study (Health Professionals Follow-Up Study) Mean follow-up 6.9 years	Type 2 diabetes, free of CVD at baseline Men only Age: 40–75 years No information on BMI or metabolic control	n=3 497 at baseline *Caffeinated coffee, cups* None: 5 489 person-years 1/month to 4/week: 5 184 5 to 7/week: 7 250 2 to 3/day: 4 855 ≥4/day: 1 289 Loss to follow-up not reported 538 deaths 435 CVD events 111 stroke events	Validated FFQ Repeated measurements not reported Adjustment for age, smoking status, BMI, physical activity, alcohol intake, family history of myocardial infarction, duration of diabetes, diabetes therapy, dietary factors (including total energy intake)	*Total cardiovascular events* <1: RR 1.00 1/month to 4/week: RR 0.77 (0.53–1.10) 5 to 7/week: RR 0.93 (0.67–1.28) 2 to 3/day: RR 0.66 (0.45–0.97) ≥4/day: RR 0.88 (0.50–1.57) *CHD events* <1: RR 1.00 1/month to 4/week: RR 0.63 (0.41–0.97) 5 to 7/week: RR 0.90 (0.62–1.31) 2 to 3/day: RR 0.66 (0.42–1.02) ≥4/day: RR 0.81 (0.41–1.62) *Stroke events* <1: RR 1.00 1/month to 4/week: RR 1.15 (0.58–2.27) 5 to 7/week: RR 0.97 (0.51–1.86) 2 to 3/day: RR 0.63 (0.29–1.36) ≥4/day: RR 0.97 (0.33–2.85) *All-cause mortality* <1: RR 1.00 1/month to 4/week: RR 0.69 (0.47–1.02) 5 to 7/week: RR 0.89 (0.63–1.26) 2 to 3/day: RR 0.71 (0.47–1.06) ≥4/day: RR 0.80 (0.41–1.54)	High Differences in socioeconomic status assumed to be modest The relevance is compromised due to coffee consumption pattern that is different from that in Sweden

The table continues on the next page

Table 3.4.8 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG	Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events	Method of dietary measurements Repeated measurements Confounders adjusted for	Results Effects/adverse effects Adherence to exposure	Study quality Comments
Zhang 2009 [26] USA	Prospective cohort study (Women's Health Study) Mean follow-up 8.7 years	Type 2 diabetes, free of CVD at baseline Women only Age: 30–55 year Mean BMI approximately 30 kg/m^2 No information non metabolic control	n=7 170 at baseline <1 cup/month: 1 451 1 cup/month to 4/week: 1 076 5–7 cups/week: 2 302 2–3 cups/day: 1 717 ≥4 cups/day: 624 Drop outs not reported 658 incident cases of cardiovascular disease 734 deaths from all causes	Validated FFQ. Repeated measurements of coffee consumption. Adjustment for age, smoking status, BMI, alcohol intake, family history of myocardial infarction, hypertension, hypercholesterolemia, menopausal status, use of hormone therapy, physical activity, multivitamin use, vitamin E supplement use, total energy intake, duration of diabetes and diabetes therapy	*Total CHD* <1/month: RR 1.0 1/month to 4/week: RR 0.94 (0.67–1.30) 5–7/week: RR 1.14 (0.86–1.50) 2–3/day: RR 0.80 (0.57–1.12) ≥4/day: RR 0.70 (0.43–1.14) *Fatal CHD* <1/month: RR 1.0 1/month to 4/week: RR 1.41 (0.90–2.22) 5–7/week: RR 1.12 (0.74–1.69) 2–3/day: RR 0.91 (0.56–1.46) ≥4/day: RR 0.67 (0.33–1.36) *Stroke* <1/month: RR 1.0 1/month to 4/week: RR 1.24 (0.80–1.93) 5–7/week: RR 1.13 (0.76–1.70) 2–3/day: RR 1.16 (0.73–1.85) ≥4/day: RR 0.86 (0.40–1.84) *All-cause mortality* <1/month: RR 1.0 1/month to 4/week: RR 1.10 (0.86–1.40) 5–7/week: RR 1.04 (0.84–1.30) 2–3/day: RR 0.87 (0.67–1.12) ≥4/day: RR 0.80 (0.55–1.14)	High Differences in socioeconomic status assumed to be modest The relevance is compromised due to coffee consumption pattern that is different from that in Sweden

BMI = Body mass index, CHD= Coronary heart disease; CVD= Cardiovascular disease;
FFQ = Food Frequency Questionnaire; FPG = Fasting plasma glucose; HR = Hazard ratio;
Q = Quartile; RR = Relative risk

Table 3.4.9 *Observational studies of tea consumption in patients with diabetes.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Exposure Numbers at baselines Drop outs Number at follow-up Number of outcome events**	**Method of dietary measurements Repeated measurements Confounders adjusted for**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Bidel 2006 [24] Finland	Prospective cohort study Individuals with diabetes within six randomly selected cohorts Mean follow-up 20.8 years	Type 2 diabetes Approximately 50% women Mean age approximately 48 years Mean BMI: 29.8 kg/m^2 No information on metabolic control	n=3 837 at baseline 3 837 participants None lost to follow-up 1 471 deaths 598 CHD deaths 210 stroke deaths	Questionnaire at baseline No repeated measurements Adjustment for age, sex, study year, BMI, blood pressure, total cholesterol, education, alcohol and tea consumption, smoking status	*Total mortality* 0: HR 1.00 1–2 cups: HR 0.84 (0.73–0.96) >=3 cups: HR 0.87 (0.71–1.06) *CVD mortality* 0: HR 1.00 1–2 cups: HR 0.85 (0.71–1.00) >=3 cups: HR 0.85 (0.66–1.10) *CHD mortality* 0: HR 1.00 1–2 cups: HR 0.85 (0.69–1.05) >=3 cups: HR 0.76 (0.54–1.05) *Stroke mortality* 0: HR 1.00 1–2 cups: HR 0.96 (0.67–1.37) >=3 cups: HR 1.26 (0.79–2.00)	Moderate Uncertain adherence to exposure during long follow-up

BMI = Body mass index; CHD = Coronary heart disease; CVD = Cardiovascular disease;
FPG = Fasting palsma glucose; OR = Odds ratio; HR = Hazard ratio; RR = Relative risk;

Table 3.4.10 *Randomised controlled study of alcohol consumption in persons with diabetes.*

First author Year Reference Country	**Study design Setting Duration of trial**	**Population/patient characteristics at baseline Women/men Age BMI/HbA_{1c}/FPG**	**Numbers at baseline Drop outs Number at follow-up**	**Method of dietary measurements Repeated measurements**	**Results Effects/adverse effects Adherence to exposure**	**Study quality Comments**
Marfella 2006 [21] Italy	Randomised controlled trial Survivors of a first myocardial infarction in the last 2 months Duration of trial 12 months	n=115 at baseline Type 2 diabetes <70 years old Sex distribution not given Mean age: 36 years Mean BMI: 28.1 Mean HbA_{1c}: 7.3% Mean FPG: 7.5 mmol/L All laboratory variables closely similar in the intervention (red wine) and control groups at baseline	Mediterranean diet with 1 glass of red wine (11 g alcohol) per day: 68 Mediterranean diet with no alcohol: 63 Drop outs 11 in the intervention (red wine) group, 5 in the control group	4-day food diary every 3rd month	No significant differences in BMI, blood pressure, FPG, total cholesterol or triglycerides at 12 months end of follow-up Significantly higher fasting insulin and HDL cholesterol in the intervention group	Moderate No intention-to-treat analysis Relevance compromised due to remarkably low mean age

BMI = Body mass index; FPG = Fasting plasma glucose; HDL = High density lipoprotein

Table 3.5.2 *Intensive lifestyle treatment in persons with impaired glucose tolerance or impaired fasting glucose.*

First author Year Reference Country	**Study design Setting Duration of follow-up**	**Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG**	**Interventions/ reference group Number at baseline Drop out rate**	**Method of dietary measurement Repeated measurements**	**Results Effects/side effects Adherence to intervention**	**Study quality Comments**
Diabetes Prevention Program Research Group 2002 [4] USA In a separate paper dietary intake between baseline and 1-year follow-up within the DPP study is reported in more detail [7]	RCT Procedure of randomisation is described 27 clinical centers within the USA Mean of follow-up 2.8 years	High-risk subjects for getting type 2 diabetes with impaired FPG (5.3–6.9 mmol/L) and impaired glucose tolerance (2-hour glucose 7.8–11.0 mmol/L) and BMI ≥24 kg/m^2 (n=3 234) *I (intensive lifestyle)* Women: 734 (68%) Men: 345 (32%) *C (placebo)* Women: 747 (69%) Men: 335 (31%) The Metformin treatment arm is not reported in this table (n=1 073) *Age (years)* I: 50.6±11.3 C: 50.3±10.4 *BMI (kg/m^2)* I: 33.9±6.8 C: 34.2±6.7 *FPG (mmol/L)* I: 5.95±0.5 C: 5.98±0.5	I: Intensive lifestyle intervention achieving a 7% weight loss using a healthy low-calorie low-fat diet and increased physical activity for at least 150 min/week C: Standard lifestyle recommendation with written information and a 30-minute individual session. Repeated annually *At baseline* I: n=1 079 C: n=1 082 A total of 2 161 Drop out rate: 7.5% not attending a scheduled visit within the previous 5 months	The National Cancer Institute's Health, Habits and History Questionnaire (HHHQ), adapted for use in the Insulin Resistance Atherosclerosis Study (IRAS) and validated within that study	The incidence of diabetes was lower in the intensive lifestyle group 4.8 cases per 100 person-years than in the placebo group 11.0 cases per 100 person-years or in other words 58% (95% CI 48–66) lower in the lifestyle group compared with the placebo group Rates of adverse events, hospitalisation and mortality were similar between the groups, showing the intervention to be safe Adherence to study goals (weight reduction and exercise) was followed at 24 weeks showing 50% of the lifestyle group to achieve the goal of weight loss (≥7% of initial body weight) and 74% the goal of exercise (≥150 minutes per week). Average fat intake in the lifestyle group decreased by 6.6 E% at 1-year follow-up and by 0.8 E% in the placebo group	High

The table continues on the next page

Table 3.5.2 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Kosaka 2005 [11] Japan	RCT using a 4:1 (C:I) ratio. The procedure of randomising not described High-risk screening for diabetes among government employees Follow-up every 6 months for 4 years	High-risk subjects for getting type 2 diabetes with IGT (single 100 g OGTT and 2-hour plasma glucose of > 8.96) (n=458; control n=356 and intervention n=102) Only men Proportions of age-groups in the 30s, 40s, 50s and 60s are reported and no large differences are found *BMI kg/m²* I: 24.0±2.3 C: 23.8±2.1 *FPG (mmol/L)* I: 6.3±0.4 C: 6.3±0.5	I: Lifestyle intervention. Individually tailored dietary advice every 3–4 months. Reduction of portion sizes, consuming more vegetables and lower intake of fat. Daily moderate exercise is recommended C: Advice to take 5–10% smaller meals and to increase physical activity. Repeated every 6 months *Drop out rate* At 1-year follow-up I: 4.7% C: 5.6% At 4-year follow-up I: 6.9% (n=7) C: 9% (n=32) No reasons given for drop out	No method of dietary measurement reported	Cumulative incidence of diabetes at 4-year follow-up was 3% in the intervention group and 9.3% among the controls (significant difference between groups). A reduction in the intervention group by 67.4% No adverse reactions reported in the study Adherence to the lifestyle intervention was not reported	Low There is a total lack of description on the procedure of randomisation, adherence and no description of dietary measurement

The table continues on the next page

Table 3.5.2 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Pan 1997 [2] China	Cluster RCT, subjects were randomised by clinic. Factorial design for diet and exercise 33 local health clinics in the northern part of China Follow-up every 2 years for 6 years	High-risk subjects for getting type 2 diabetes with IGT (n=530); Only the lifestyle (diet + exercise) intervention is reported here *I ((D+E) diet + exercise) n=126* Women: 56 Men:70 *C (control) n=133* Women: 60 Men: 73 *Age (years)* I: 44.4±9.2 C: 46.5±9.3 *BMI (kg/m^2)* I: 26.3± 3.9 C: 26.2±3.9 *FPG (mmol/L)* I: 5.67± 0.80 C: 5.52±0.82	I: (D+E) Diet and exercise group: Low-fat diet with carbohydrate 55–65% and fat 25–30%. Increase physical exercise by 1 unit/day, e g 30 min of slow walking or 20 min of faster walking. If <50 years 2 units/day. Weekly sessions for 1 month, monthly for 3 months, and then every 3 months C: General information about diet and physical activity Drop out rate for the whole study at 6-year: 47/577 subjects (8.2%)	Food intake and physical activity were quantified at baseline and at every 2 years (evaluation exam) using standardised forms and interviews. For dietary intake, quantity per day for the past 3 days was ascertained for major food/beverage items	Cumulative incidence of diabetes at 6-year follow-up (mean and 95% CI) I: 44.6 (36.1–53.1) C: 65.9 (57.5–76.3). In other words significantly lower cumulative incidence of diabetes in the intervention group At 6-year follow-up, there were no significant reductions in estimated calorie intake or in proportions of macronutrients between the groups No adverse reactions were reported in the study Adherence to the intervention was not reported	Low The used dietary measurement methods were not capable of a detailed assessment of dietary changes The IGT subjects had a very high rate of worsening to diabetes compared with European studies

The table continues on the next page

Table 3.5.2 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Ramachandran 2006 [5] India	RCT Procedure of randomisation not described. Factorial design using both lifestyle and metformin A community-based study, recruiting from the middle-class population identified within work-places Median follow-up 30 months	High-risk subjects for getting type 2 diabetes with IGT on 2 occasions (persistent IGT) (n=531) Women: 110 Men: 421 Age: 45.9±5.7 years BMI: 25.8±3.5 kg/m^2 FPG: 5.4±0.8 mmol/L	Randomised into 4 study groups, but only lifestyle arm and control reported here I: Lifestyle modification (LSM) group. Healthy diet and regular physical activity, reduction in total calories, refined carbohydrates and fats, and inclusion of fibre-rich foods. Monthly telephone contacts and personal sessions every 6 months C: Standard health care advice *At baseline* I: n=133 C: n=136 Drop out rate: 7.6% (13/169) not available for final follow-up	Not reported in the paper. Electronic supplementary material (ESM) text box shows diet recommendations, including a reduction of total fat intake to ≤20 g/day, i e 10 E% fat if 2 000 kcal per day	The 3-year cumulative incidence of diabetes was lower in the lifestyle intervention group (LSM) 39.3% compared with the control group (C) 55.0%, a relative risk reduction with 95% CI of 28.5 (20.5–37.3) Rates of adverse events were reported, 2 cases of cardiovascular events in control group and 4 in LSM Adherence to diet, physical activity and metformin medication was reported	Moderate The study shows no additive effect of having the combined treatment of lifestyle and metformin Not well defined diet in an Indian population lowers the relevance

The table continues on the next page

Table 3.5.2 continued

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Tuomilehto 2001 [3] Finland	RCT using a randomisation list Five study centers within health care in Finland Mean of 3.2 years	High-risk subjects for getting type 2 diabetes with IGT (mean of 2 OGTT) and overweight (n=523) I: 174 women and 91 men C: 176 women and 81 men. One subject with type 2 diabetes excluded after randomisation *Age (years)* I: 55±7 C: 55±7 *BMI (kg/m^2)* I: 31.3±4.6 C: 31.0±4.5 *FPG (mmol/L)* I: 6.1±0.8 C: 6.2±0.7	I: Intensive lifestyle intervention, individually tailored. Year 1: 7 sessions, and thereafter 1 session every 3 months. Supervised exercise were offered. Intervention goals: Reduce body weight by 5% or more, total fat intake <30 E%, saturated fat <10 E%, increase fibre intake, and physical activity at least 30 min/day C: Oral and written general information *At baseline* I: n=265 C: n=257 A total of 522 Drop out rate 8% (n=40) I: n=23 C: n=17	Food record for 3-days every 3 months (4 times per year)	Diabetes incidence after 3 years 3.2 subjects per 100 person-years in the intensive lifestyle group and 7.8 subjects per 100 person-years among the controls. A reduction of diabetes development of 58% in the intervention group (Cox regression HR 0.4, 95% CI 0.3–0.7) No adverse reactions reported in the study Adherence to study goals (weight reduction, fat intake, saturated fat intake, fibre intake and exercise) was achieved by 43, 47, 26, 25 and 86% of the subjects in the intervention group and by 13, 26, 11, 12 and 71% of the subjects in the control group During the study period, no subject achieving 4 or more study goals did develop diabetes	High In another paper from the DPS with a median follow-up of 7 years, the reduction in diabetes development was still 43% in the intervention compared with the control group [9]

The table continues on the next page

Table 3.5.2 *continued*

First author Year Reference Country	Study design Setting Duration of follow-up	Population/Patient characteristics Women/men Age (mean, range) BMI/HbA_{1c}/FPG	Interventions/ reference group Number at baseline Drop out rate	Method of dietary measurement Repeated measurements	Results Effects/side effects Adherence to intervention	Study quality Comments
Wein 1999 [12] Australia	RCT. Procedure of randomisation not described Mercy Hospital for Women, Melbourne 51 months (>4 years)	High-risk subjects for getting type 2 diabetes with gestational diabetes. All subjects having IGT (n=200) were randomised to one of two forms of dietary advice. 100 women were enlisted in the intervention group and 100 women in the control group *Age (mean, 95% CI, years)* I: 39.5 (38.2–40.8) C: 37.8 (36.5–39.0) *BMI (mean, 95% CI, kg/m²)* I: 25.2 (24.1–26.4) C: 25.6 (24.5–26.8) *FPG (mean, 95% CI, mmol/L)* I: 5.5 (5.4–5.7) C: 5.6 (5.5–5.8)	I: Dietary advice according to the Target of Healthy Eating and telephone contact with a dietician every 3 months. Regular physical activity, e g brisk walks for 30 min 3 times per week C: Oral and written dietary information according to the Target on Healthy Eating. Regular physical activity, e.g. brisk walks for 30 min 3 times per week *At baseline* I: n=100 C: n=100 A total of 200 Drop out rate is not presented in the paper	Each subject completed a questionnaire where fat, residue and sugar content of the diet were scored from 1 to 3 (representing poor to good) and the total score was calculated	At the final follow-up test after a median of 51 months, there was no significant difference between the intervention and the control groups in the prevalence of diabetes and impaired glucose tolerance. The intervention group had a longer median length of follow-up than the control group (58.6 months vs 47.9). Adjusting for this and calculating the annual diabetes incidence rate resulted in a rate of 6.1% in the intervention group and 7.3% in the control group or an incident rate ratio of 0.83 (95% CI 0.47–1.48) No adverse reactions reported in the study Adherence to diet and exercise was followed by the questionnaire. The diet score at baseline did not differ between the groups at baseline and improved in both groups during the study	Low The procedure of randomisation and the drop out rate is not reported in detail. No valid measurement of dietary intake has been used Low resources were used to modify behaviour and the difference in used resources between the study groups was minor

BMI = Body mass index; C = Control; CI = Confidence interval; FPG = Fasting plasma glucose; HR = Hazard ratio; I = Intervention; IGT = Impaired glucose tolerance; OGT = Oral glucose tolerance test; RCT = Randomised controlled trial

Table 5.1 *Economic aspects of dietary treatment of diabetes, empirical studies.*

First author Year Reference Country	Studydesign Follow-up time	Population characteristics	Intervention vs Control Drop outs	Outcome Effects	Outcome Costs, resource	Study quality
Franz 1995 [1] USA	RCT 6 months	Type 2 diabetes Ages 38–76 years n=94+85	Practice Guidelines Nutrition Practice (PGC) vs Basic Nutrition Care (BN) Drop outs specified in previous study	Fasting plasma glucose level (NS) HbA_{1c} (NS)	+ $ 70 per patient for PGC i e for dietitians	Low
Glasgow 1997 [2] USA	RCT 12 months	Type 1 diabetes or type 2 diabetes Ages 40+ years n=108+98	Brief intervention Computer-assisted dietary Assessment vs Conventional care Drop outs: n=2+4	HbA_{1c} (NS)	+ $ 137 per patient for computer intervention	Moderate
Wolf 2007 [3] USA	RCT 12 months	BMI: ≥27 and type 2 diabetes Ages: 53.4 ±8.0 and 53.3 ±8.6	Lifestyle Case Management and Medical Nutrition Therapy vs Conventional care Drop outs: n=2+1	None measured	Reduced costs per patient of case Management of Total health care costs of $ 3 586 less ($p<0.05$)	Low
Norris 2001 [4] USA	Systematic review of RCT. In all 72 studies of which 6 with focus on diet and costs	Type 2 diabetes Ages 45–62	Information and Lifestyle interventions, respectively	No conclusion on effects	No conclusion on costs	Moderate

BMI = Body mass index; NS = Not significant; RCT = Randomised controlled trial

Table 5.2 *Economic aspects of dietary treatment of diabetes, model studies.*

First author Year Reference Country	Studydesign Follow-up time	Population characteristics	Intervention Vs Control Drop outs	Outcome effects	Outcome Costs, resource	Study quality
Avenell 2004 [5] England	Systematic review Economic model based on Markov 6 years	Type 2 diabetes Impaired glucose tolerance	Lifestyle intervention of low fat diet and exercise vs Controls with information Compliance not mentioned	QALY	Per person year one +£ 324 and subsequent years +£ 178 *ICER per QALY* Year 1: £ 113,905 Year 6: £ 13,389	High
Palmer 2004 [7] Switzerland	Markov model based on previously published study Patient lifetime	Type 2 diabetes Mean age: 50.6 years Calculated for 5 countries	Metformin vs Intensive Lifestyle Changes (ILC) vs Usual care	Years free of diabetes mellitus +1.77 to +1.82 Life Expectancy (LYG) +0.06 to +0.16	Lifetime costs, Cost saving for 4 out of 5 countries (not for England), i e £ –455 to –1 036	Moderate

BMI = Body mass index; NS = Not significant; QALY = Quality adjusted life year;
RCT = Randomised controlled trial