Evidence Tables
DIET 1: Which forms of dietary advice are effective treatments for people with type 2 diabetes?

Reference	Study type Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Effect size	Source of funding
Barnard ND, Cohen J, Jenkins DJA, TurnerMcGrievy G, Gloede L, Jaster B et al. A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. Diabetes Care 2006; 29(8):1777-1783. Ref ID: 4817	RCT 1+	N=99	Inclusion criteria: Type 2 diabetics defined by: fasting plasma glucose > 6.9mmol/l on 2 occassions or, previously diagnosed T2D on oral hypoglycaemics for ≥ 6 months Exclusion criteria: HbA_{1c} <6.5 or >10.5% Use of insulin for > 5 years Current smoking, alcohol or drug use Pregnancy Unstable medical status Currently on low-fat vegetarian diet No significant differences between groups at baseline No allocation concealment Blinding not possible for participants, was	Low fat vegan diet[1] (energy intake:~10% fat, 15% protein, 75% carbohydrate) Vitamin B_{12} supplementation Exercise stays constant	American Diabetes Association (ADA) diet guidelines An individualised diet was created based on body weight, and plasma lipid concentrations (15—20% protein, <7% saturated fat, 60-70% carbohydrate and monounsaturated fats, cholesterol ≤200mg/day) Exercise stays constant All participants with BMI >25 kg/m^2 were	22 weeks	HbA_{1c} Body weight	<u>Weight loss</u> Body weight reduced in both groups but the difference was significant only in those who were medication stable: Vegan 6.5kg and ADA 3.1kg, P<0.001 BMI declined in both groups: 1.2 +/- 0.7kg/m2 (P= 0.08) Waist-to-hip ratio declined in vegan group, not in ADA: 0.02 +/- 0.01 (P=0.003) <u>Glycemic control</u> HbA_{1c} declined in both groups Vegan: 0.96% (P<0.0001) ADA: 0.56% (P=0.0009) Between groups P=0.089 Baseline adjusted P=0.091 In participants whose medication was unchanged HbA_{1c} declined in both groups: Vegan 0.123% and ADA 0.38%, P=0.01 <u>Change in anti-diabetic medication use</u> Vegan group: 43% (21/49) reduced and 8% (4/49) increased their diabetic medications.	National institute of diabetes and digestive and kidney diseases, Diabetes action research and education foundation

[1] Dietary adherence for the vegan group was defined as the absence of meat, poultry, fish, dairy, or egg intake, saturated fat ≤and total fat ≤25% of energy, and average daily cholesterol intake ≤50mg.

			done for assessors. ITT analysis		prescribed daily energy deficits of 500-1000 calories.			ADA group: 26% (13/50) reduced and 8% (4/50) increased their medications. <u>Blood pressure control</u> Blood pressure, there were non significant reductions in systolic and diastolic blood pressure in both groups: Systolic 0.2 +/- 5.3 mmHg (P=0.93) Diastolic 1.8 +/-3.4mmHg (P=0.30) <u>Blood lipid control</u> For the entire sample although there were significant decreased in lipid parameters from baseline within groups, there were no between group differences. Among those whose lipid controlling medications remained constant: Total cholesterol reduced in both groups Vegan 33.5+/-21.5 mg/dl (p<0.0001) ADA 19.0+/-28.5 mg/dl (P<0.0001) Between groups reduction of 14.5 +/-12.3mg/dl (P=0.01) Non-HDL cholesterol reduced in both groups Vegan 27.6+/-21.1 mg/dl (p<0.0001) ADA 16.3+/-30.1 mg/dl (P<0.05) Between groups reduction of 11.3 +/-11.6mg/dl (P=0.05) LDL cholesterol reduced in both groups Vegan 22.6+/-22.0 mg/dl (p<0.0001) ADA 10.7+/-23.3 mg/dl (P<0.05) Between groups reduction of 11.9 +/-10.2mg/dl (P=0.02) The total-to-HDL cholesterol ratio and triglyceride concentrations fell for both groups.	

Daly ME PR. Short-term effects of severe dietary carbohydrate-restriction advice in Type 2 diabetes--a randomized controlled trial. Diabetic medicine : a journal of the British Diabetic Association 2006; 23(1):15-20. Ref ID: 821	RCT 1+ Study aimed at examining the short term effects and safety of very low carbohydrate dietary advice in obese type 2 diabetics.	N=102, 51 patients in each arm Multicentre study, 3 Uk centres. Loss to follow up 21%	Inclusion criteria: Type 2 diabetics with poor control (HbA_{1c} 8-12%) Obese (BMI ≥ 30 kg/m^2) Serum creatinine <150 µmol/l Hospital based, diabetes consultant care Exclusion criteria: unexplained weight loss or ketosis No significant differences between groups at baseline. Block randomisation Blinding not possible ITT analysis, although not specifically stated.	N=51 Low carbohydrate (LC) diet (up to 70g carbohydrate/day) ½ pint of milk 1 piece fruit daily Advised to lower saturated fat and salt intake, eat oily fish twice weekly, eat 5 portions of fruit and vegetables per day, increase physical activity.	N=51 Standard healthy eating advice focusing on reduced fat intake (LF) Reduction of portion size Advised to lower saturated fat and salt intake, eat oily fish twice weekly, eat 5 portions of fruit and vegetables per day, increase physical activity.	3 months	Primary outcomes: changes in weight, HbA_{1c}, total cholesterol: HDL ratio, triacylglycerol concentrations Secondary outcomes: changes in blood pressure, dietary quality.	<u>Weight loss</u> Mean reduction in body weight in the LC arm (3.55kg) > LF arm (0.92kg) P= 0.001 <u>Glycemic control</u> HbA_{1c}: non-significant reduction in both arms; LC 0.55% vs LF 0.23%, P=0.132[2] <u>Blood pressure control</u> Systolic BP: reductions in both arms, LC>LF arm, non significant difference between arms. <u>Blood lipid control</u> Total chol/HDL ratio: mean reduction in LC arm (0.48) > LF arm (0.10) P=0.011 Triglycerides: reductions in both arms, LC>LF arm, non significant difference between arms. Dietary quality: Carbohydrate intake: LC arm had lower % energy intake (33.5% vs 45.2%; P<0.001) and lower absolute carbohydrate intake (109.5g/day vs 168.6g/day; P<0.001) Protein intake: greater % energy intake in LC arm (26.4% vs 20.9%; P<0.001) Fat intake: in LC arm greater mean % energy from fat (40.1% vs 32.9%; P<0.001), greater mean saturated fat intake (13.9% vs 11.0%; p=0.001), and non significantly greater absolute fat intake (21.0g vs 17.1g; P=0.11) Fibre intake: lower in LC arm (10.4g vs 14.3g; P=0.001) Fish intake: greater in LC arm P=0.001	Diabetes UK

[2] Authors suggest the non-significant reduction was due to the patient group having higher levels of medication and longer duration of diabetes.

								There were no significant differences in calcium intake and in the intake of fresh fruit and vegetables between groups, with neither group achieving recommended intakes.	
Li Z, Hong K, Saltsman P, DeShields S, Bellman M, Thames G et al. Long-term efficacy of soy-based meal replacements vs an individualized diet plan in obese type II DM patients: Relative effects on weight loss, metabolic parameters, and C-reactive protein. European Journal of Clinical Nutrition 2005; 59(3):411-418. Ref ID: 518	RCT 1+	N=104 Loss to follow up 26%	Inclusion criteria: Type 2 diabetics on oral hypoglycaemic agents BMI 27-40 kg/m^2 HbA1c 7-12% No change in diabetics medication in prior 3 months Exclusion criteria On insulin therapy Significant diabetes related complications, like diabetic nephropathy, neuropathy or proteinuria History of psychiatric or other major medical conditions ITT analysis	Soy based meal replacement (MR) For 5 days three meals per day replaced with a MR For 3 months, 2 meals per day replaced with MR For 3 months, 1 to 2 meals replaced with MR Target of daily caloric deficit of 500 calories.	Individualised diet plan (IDP) that met the American Diabetes Association (ADA) criteria (energy content: <30% fat, 10-20% protein, 55-65% carbohydrate) Target of daily caloric deficit of 500 calories.	1 year	Body weight Glycaemic control Insulin Lipid levels, high-sensitivity C-reactive protein (hs-CRP)	<u>Body weight</u> Subjects in both groups lost clinically significant amounts of weight over the 12 months. Average body weight reduction at 6 months: MR 5.24 +/- 0.60kg IDP 2.85+/-0.67kg Comparison between groups P=0.0031 Average body weight reduction at 12 months: MR 4.35+/-0.81kg IDP 2.36+/-0.76kg Comparison between groups P=0.0670 Similar changes observed in BMI at 12 months MR 1.47+/-0.27 kg/m^2 IDP 0.77+/-0.25 kg/m^2 Comparison between groups P=0.0678 %weight loss MR 4.57 +/-0.81% IDP 2.25+/-0.72% Comparison between groups P<0.05 <u>Glycemic control</u> HbA1c levels were reduced but not significantly lower than starting levels. Mean HbA1c was lower in MR than IDP group 0.49+/-0.22% (P=0.0291) Plasma glucose concentrations were significantly lower in the MR group than in the IDP group at 3 (P=0.04), 6	Meal replacements were provided by SlimFast foods Serology studies processed by quest diagnostics

								(P=0.002) months but not at 12 months. <u>Blood lipid control</u> There were no significant differences between groups during the study for lipid parameters. Total cholesterol There were significant decreases from baseline values in both groups at 3 months: MR 21.52 mg/dl (P<0.0001) IDP 11.04 (P=0.025) By 12 months these decreases had reversed and were no longer significantly different from baseline values. Triacylglycerol also decreased in the MR group and at 12 months had decreased by 28.00mg/dl, which was significantly different from baseline values (P=0.038) IDP group there was an overall decrease of 28.89mg/dl but at 12 months this was not significantly different from baseline (P=0.119) LDL at 12 months: MR: decrease overall by 6.10 mg/dl from baseline (P=0.255) IDP: increase from baseline by 8.76 mg/dl (P=0.129) HDL at 12 months MR: decreased by 0.97 mg/dl (P=0.345) IDP increased by 2.26 mg/dl (P=0.012) <u>CRP</u> Hs-CRP (N=50) Between group comparison not presented. In the MR group, hs-CRP	

								decreased significantly compared to baseline (P=0.028) <u>Changes in medication</u> A greater number of subjects in the MR group reduced their use of sulphonyureas (P<0.0001) and metformin (P<0.05) as compared to the IDP group.	
Redmon JB, Susan KR, Kristell PR, Joyce E Swanson. One-year outcome of a combination of weight loss therapies for subjects with type 2 diabetes: A randomized trial. Diabetes Care 2003; 26(9):2505. Ref ID: 4876	RCT 1+	N=61	Inclusion criteria: Age 30-70 years Type 2 diabetics HbA_{1c} 7-10% BMI 27-50 kg/m^2 Stable weight for 3 months Constant doses of all oral medication: for diabetes, hypertension, lipids for 1 month Exclusion criteria: Insulin use in last 6 months Prior sibutramine use Use of any weight loss product, weight loss management programme Abnormal screening tests History of heart disease or stroke Previous bariatric surgery Lactose intolerance Any chronic disease that will make adherence difficult. There were no significant differences	Combination therapy weight loss programme for 2yrs (C therapy) In addition to standard therapy: Sibutramine 10 mg daily, increased to 15 mg daily if BMI remained >27 kg/m^2 Low calorie diets (900-1300kcal/day) for 7 consecutive days every 2 months Use of 1 meal replacement product and one snack bar per day in between low calorie-diet weeks	Standard therapy (S therapy): individualised diet with 500-1000kcal reduction in intake/day Individualised exercise prescription Educational programme	1 year	Weight loss HBA_{1C} Blood pressure Pulse rate Fasting plasma lipids	<u>Weight loss</u> Weight loss was significantly greater in the combination therapy group: C therapy 7.3 +/- 1.3kg S therapy 0.8 +/- 0.9kg (P<0.001) Significantly greater decreases in BMI, fat mass and lean body mass at 1 year in the combination group. <u>Glycaemic control</u> HbA_{1C} declined only in C therapy 0.6 +/- 0.3%, no change in S therapy (P=0.05) Adjusting for medication changes, this difference was still significant. <u>Blood pressure control</u> Changes in blood pressure and pulse rate did not differ between the 2 groups at 1 year. <u>Blood lipid control</u> Changes in fasting plasma lipids did not differ between the 2 groups at 1 year. <u>Change in anti-diabetic medication use</u> C therapy: 7 subjects decreased and 4 subjects increased their diabetes medications, S therapy: 1 subject decreased and 16 subjects increased their diabetes medications. (P≤0.01) <u>Adverse events</u> No serious adverse events relate to the	NIH Abbot Laboratories Slim Fast Nutrition Institute

			between treatment groups in baseline demographic, clinical or metabolic parameters.					study treatment.	
Brinkworth GD NM. Long-term effects of advice to consume a high-protein, low-fat diet, rather than a conventional weight-loss diet, in obese adults with type 2 diabetes: one-year follow-up of a randomised trial. Diabetologia 2004; 47(10):1677-1686. Ref ID: 803	RCT 1-	N=66 (randomised) 2 withdrew before commencement Loss to follow up 39%	Inclusion criteria: Type 2 diabetes Overweight or obese (BMI 27-40 kg/m^2) Exclusion criteria: Proteinuria Liver, respiratory or gastrointestinal disease Unstable cardiovascular disease Malignancy Matched on sex, BMI, fasting plasma glucose	N=33 Loss to follow up 14 High protein diet 8 week energy restriction period (energy content: 30% protein, 40% carbohydrate, 30% fat) 4 week energy balance period (30% caloric intake increase, 21g additional protein) Follow dietary pattern for 52 weeks Diets were matched for fatty acid profile.	N=31 Loss to follow up 12 Low protein diet 8 week energy restriction period (energy content: 15% protein, 55% carbohydrate, 30% fat) 4 week energy balance period (30% caloric intake increase, 7g additional protein) Follow dietary pattern for 52 weeks	64 weeks	Body weight Body composition Blood pressure Glycaemic control Blood lipids	<u>Weight loss</u> Mean weight loss after 12 weeks was the same in both groups 5.3kg (P=0.17) Mean weight loss after 64 weeks LP diet -2.2+/-1.1kg HP -3.7+/-1.0kg which was significantly different from baseline (P<0.01) <u>Glycaemic control</u> There were significant reductions in fasting blood glucose (P<0.05), fasting insulin (P<0.01), HOMA (P<0.01) and HbA1c (P<0.001) at week 12, however at week 64 there had been increases in these parameters such that there was no difference from baseline. There were no significant differences between diets. <u>Blood pressure control</u> Systolic BP decreased equally in both diets by 6mmHg (P=0.95) during the weight loss period During the follow up, SBP increased by 8mmHg more in the Lp than in the HP group (P=0.04) Diastolic BP similarly in the weight loss period DBP decreased in both groups (P=0.48). During the follow up, DBP was 5.7mmHg higher in the LP group (P=0.008) <u>Blood lipid control</u> Serum triacylglycerol, total cholesterol and total cholesterol:HDL-C ratio fell significantly in both groups at week 12 but increased during the follow-up, such	

								that at week 64 there were no significant differences compared to baseline. Fasting serum HDL-C did not change by week 12 but by week 64 had increased by 17% in both diet groups. This was not affected by diet, sex, changes in body weight or fat mass.	
Stern L, Iqbal N, Seshadri P, Chicano KL, Daily DA, McGrory J et al. The effects of low-carbohydrate versus conventional weight loss diets in severely obese adults: one-year follow-up of a randomized trial. Ann Intern Med 2004; 140(10):778-785. Ref ID: 4959	RCT 1-	N= 132 obese adults (N=54 T2D patients - 41%)	Inclusion criteria: Participants were 18 years of age and older with a BMI of 35 kg/m2 or greater. Exclusion criteria: Serum creatinine level greater than 133 µmol/L (>1.5 mg/dL), hepatic disease, severe life-limiting medical illness, inability to self-monitor glucose levels, or active use of a weight loss program or weight loss medication Baseline characteristics: participants were well matched between diet groups regarding baseline characteristics. 20 persons on the low-carbohydrate diet and	Counselling[3] to Low-carbohydrate diet (<30g per day) N= 64	Counselling to Conventional diet (< 30% of calories from fat) N= 68	1 year	Body weight Lipid profile Glycemic control	**Body weight**[4] By 1 year, mean (±SD) weight change for persons on the low-carbohydrate diet was -5.1 ± 8.7 kg compared with -3.1 ± 8.4 kg for persons on the conventional diet. Differences between groups were not significant (-1.9 kg [95% CI, -4.9 to 1.0 kg]; p= 0.20). **Lipid profile** <u>LDL</u> NS <u>Tg</u> Tg levels decreased more in the low-carbohydrate group than in the conventional diet group (p=0.41) <u>HDL</u> HDL concentration decreased more in the conventional diet group than in the low-carbohydrate group (p=0.014) **Glycemic control** HbA1c level in the small group of persons with diabetes (N= 54) decreased more in the low-carbohydrate group,	Veterans Affairs Healthcare Network Competitive Pilot Project Grant.

[3] Diet groups met in weekly counselling sessions for 4 weeks, followed by 11 monthly sessions. Participants on the low-carbohydrate diet were instructed only to reduce carbohydrate intake to less than 30 g per day. Participants on the conventional diet were instructed to reduce caloric intake by 500 calories per day, with less than 30% of calories derived from fat.

[4] There were some differences between the persons who completed the study and those who dropped out, such as greater weight loss in the former. In addition, most persons did not meet their dietary targets (<30 g of carbohydrate daily in the low-carbohydrate group and reduction of 500 calories per day in the conventional diet).

			25 on the conventional diet dropped out by 1 year.					after adjustment for baseline differences This difference remained significant after weight loss amount was added to the model (p= 0.019). However, the significance of the difference in the response of HbA1c was not confirmed by an analysis that included only the persons who completed the study (adjusted p=0.080) or when baseline values were carried forward for missing persons (adjusted p= 0.18). **Adverse events** Changes in serum creatinine concentration did not significantly differ between groups. However, blood urea nitrogen level increased more in the low-carbohydrate diet group. Changes in uric acid level were not clinically significant. **Drop-outs** findings were limited by a high dropout rate **(34%)** and by suboptimal dietary adherence of the enrolled persons.	
van ST, Van de Laar FA, van Leeuwe JF, Lucassen PL, van den Hoogen HJ, Rutten GE et al. The dieting dilemma in patients with newly diagnosed type 2 diabetes: does dietary restraint predict weight gain 4 years after diagnosis? Health Psychology 2007; 26(1):105-112.	Prospective cohort study 2+	N=97 Recruited from 33 general practices in the Netherlands	Newly diagnosed Type 2 diabetics[5] Age 40 – 70 years	Referral to registered dietician Individually tailored nutritional advice (to reduce energy and fat intake)		4 years	Body weight BMI Fat and energy consumption Changes in restrained and overeating tendencies	<u>Weight loss</u> Mean body weight change at 4 years Men +1.3 +/- 5.4 kg Women -1.1 +/-5.0kg Changes were not significant, P values not given. Mean change in BMI at 4 years Men 0.42 +/- 1.76kg/m^2 Women -0.40 +/- 1.89 kg/m^2 Changes were not significant, P values not given. <u>Eating behaviour</u>	Not mentioned

[5] Diabetes was defined by WHO criteria: eligible patients had symptoms suggestive of diabetes mellitus and a fasting blood glucose ≥ 6.7 mmol/L and < 20.0 mmol/L. In asymptomatic patients, the fasting blood glucose had to be ≥ 6.7 mmol/L on 2 or more occasions.

Ref ID: 4837								Restrained eating This was significantly increased in men (P<0.005) and women (P<0.0001) External eating For men this did not change, for women there was a significant decline (P=0.042) Emotional eating There was no significant change in men or women. Regression analyses Tendency to overeating at diagnosis led to increase in explained variance of the BMI at 4 years (P=0.025) Tendency to overeating at diagnosis led to increase in explained variance of intake of energy at 4 years (P=0.040) Emotional eating (P=0.044) and external eating (P=0.027) independently also significantly explained variance in energy intake at follow up. Total energy intake at 4 years <u>Dietary composition</u> Energy intakes were significantly lower in both men and women (P<0.0001) Fat energy intake In men there were no differences in total fat intake, whereas in women, a lower fat intake was reported (P<0.0001)	
The Diabetes and Nutrition Study Group of the Spanish Diabetes Association (GSEDNu). Diabetes	Case series 3	N=192 Type I diabetics N=93	Inclusion criteria: Diagnosed with diabetes and been treated at the same centre for at least 1	ADA nutritional recommendations: Monounsaturated fatty acids		6.5 years	Primary end point composite of microvascular	Adherence to the different elements of the ADA recommendations varied in type 2 diabetics by gender. Adherence to each ADA	Not stated

Nutrition and Complications Trial: adherence to the ADA nutritional recommendations, targets of metabolic control, and onset of diabetes complications. A 7-year, prospective, population-based, observational multicenter study. Journal of Diabetes & its Complications 2006; 20(6):361-366. Ref ID: 4835		Type II diabetics N=99 Study aimed at investigating the association between development of microvascular complications and nutritional patterns.	year Able to correctly fill in the 7-day food diaries	(MUFA's) and carbohydrates should provide 60-70% of energy intake Protein 15-20% of energy intake Saturated fatty acids (SFA'S) <10% of energy intake Polyunsaturated fatty acids (PUFA's) up to 10%			complications status[6]	recommendation was not associated with a reduction in the onset or progression of diabetes complications. <u>Dietary composition</u> Proportion of Type 2 diabetics that consumed a ratio of PUFAs/SFAs >0.4 were 57.1% in men (N=42) and 45.6% in women (N=57) Consumption of PUFAs/SFAs >0.4 decreases between 3.4 and 8.2x the vascular risk complications. (based on analysis of type 1 and type 2 diabetics) Proportion of Type 2 diabetics that consumed a ratio of MUFAs/SFAs >1.5 were 73.8% in men (N=42) and 69.3% in women (N=57) Consumption of MUFAs/SFAs >1.5 decreases between 3.6 and 4.7x the vascular risk complications. (based on analysis of type 1 and type 2 diabetics)	

[6] The composite of microvascular complication status was defined as the presence of diabetic nephropathy and/or diabetic retinopathy and/or diabetic distal neuropathy.