Diabetes Care and Education
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Carbohydrate Issues: Type and Amount
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Table 4. Randomized controlled trials (RCTs) evaluating the relationship between higher and lower dietary fiber intakes on glycemic and lipid outcomes in individuals with diabetes[ab]

Author / Year of Publication	Study Design	Intervention	Duration of Intervention	Population	Results[c]
Chandalia and colleagues, 2000 (36)	RCT, crossover	**Higher Fiber (HF) (g/d):** 50 grams (25 g soluble, 25 g insoluble) **Lower Fiber (LF) (g/d)** 24 grams 8 g soluble 16 g insoluble	6 wks	13 subjects (12 men, 1 woman) with type 2 diabetes **Baseline HbA1c[d]:** 6%-9.8% **Mean age:** 61 y **Mean duration of diabetes:** Onset in most patients after 40 y	**Glycemic** • **HbA1c:** No significant difference between groups (HF 6.9% vs LF 7.2%) • **24-h area under glucose curve:** 10% lower with HF vs LF (P=0.02) • **24-h area under insulin curve:** 12% lower with HF than LF (P=0.05 **Lipidemic** • **Total cholesterol:** HF 196 mg/dL[e] vs LF 210 mg/dL[e] (P=0.02) • **Triglycerides:** HF 184 mg/dL[f] vs LF 205 mg/dL[f] (P=0.02) • **HDL[g] and LDL[h]:** No significant differences between groups
Author / Year of Publication	Study Design	Intervention	Duration of Intervention	Population	Results[c]
Hagander and colleagues, 1988 (37)	RCT, crossover	**Higher Fiber (HF) (g/d):** 44 **Lower Fiber (LF) (g/d)** 16	8 wks	14 subjects (9 men, 5 women) with type 2 diabetes **Baseline**	**Glycemic** • **HbA1c:** No significantdifference between groups (HF 5.3% vs LF 5.2%)

HbA1c:
5.9%

Mean age:
69 y

Mean duration of diabetes:
3 y

- **Fasting blood glucose:** HF 113 mg/dLi vs LF 121mg/dL[i] (P=0.01)

Lipidemic

- **Total cholesterol:** HF 213 mg/dLe vs 221 mg/ dL[e] (P=0.025)
- **LDL:** HF 161 mg/dLe vs 169 mg/dL[e] (P=0.025)
- **HDL and triglycerides:** No significant differences

Author / Year of Publication	Study Design	Intervention	Duration of Intervention	Population	Results[c]
Giacco and colleagues, 2000 (38)	RCT, parallel	**Higher Fiber (HF) (g/d):** 50 **Lower Fiber (LF) (g/d)** 15	24 wks	54 subjects with type 1 diabetes completed the study (21 men, 33 women) **Baseline HbA1c:** <10% **Mean age:** 28 y **Mean duration of diabetes:** 10 y	**Glycemic** • **HbA1c (intent-to-treat analysis, 63 subjects):** No significant difference between groups (HF 8.8% vs LF 9.1%) • **HbA1c (compliant group, 46 subjects):** HF 8.6% vs LF 9.1%) (P=0.05) • **Mean daily plasma glucose:** Decreased 9%-15% both groups, with no significant difference between groups **Lipidemic** • No effect of diet observed for either intent-to-treat analysis or compliant group analysis
Kinmouth and colleagues, 1982 (39)	RCT, crossover	**Higher Fiber (HF) (g/d):** 60 **Lower Fiber (LF) (g/d)** 20	6 wks	10 subjects (6 boys, 4 girls with type 1 diabetes **Mean baseline glycosylated hemoglobin:** 11.4%	**Glycemic** • **Glycosylated hemoglobin:** no significant difference between groups (HF 10.6% vs LF 11.6%) • **Overall daily blood glucose:** HF 129 mg/ dL[i] vs vs LF 162 mg/

| | | | | Mean age: 14.1 y

Mean duration of diabetes: 4.7 y | dL[i] (P=0.01)
• **Postprandial blood glucose (mean of values 2 h after 3 main meals)**: HF 153 mg/dL[i] vs LF 220 mg/ dL[i] (P=0.001)

Lipidemic

• Not a study outcome |

Author / Year of Publication	Study Design	Intervention	Duration of Intervention	Population	Results[c]
Del Toma and colleagues, 1988 (40)	RCT, crossover	**Higher Fiber (HF) (g/d):** High soluble fiber: 32.9 (includes 14.3 g soluble fiber) High insoluble fiber: 33.6 (includes 2 g soluble fiber) **Lower Fiber (LF) (g/d)** 6.7 (includes 2 g soluble fiber)	1 meal	10 subjects (6 men, 4 women) with type 2 diabetes **Mean glycosylated hemoglobin:** 8.2% **Mean age:** 54 y **Mean duration of diabetes:** 2.9 y	**Glycemic** • Blood glucose significantly lower 30 and 60 min after, and serum insulin significantly lower 60 min after high soluble fiber meal vs other two meals **Lipidemic** • Not a study outcome

Figure 2: Exercise recommendations for general health and diabetes management and prevention.

- [a]Adapted with permission from the American Dietetic Association's Evidence Analysis Library (Diabetes Type 1 and 2; Diabetes and Carbohydrates; Evidence Analysis Question: What is the relationship between fiber and metabolic outcomes in persons with type 1 and type 2 diabetes?) (11).
- [b]Includes studies from 1980 to present in which both higher and lower fiber interventions were similar for the percentages of energy as carbohydrate, fat, and protein.
- [c]End of study between-group comparisons.
- [d]HbA1c=glycosylated hemoglobin
- [e]To convert mg/dL cholesterol to mmol/L, multiply mg/dL by 0.0259. To convert mmol/L cholesterol to mg/dL, multiply mmol/L by 38.6. Cholesterol of 193 mg/dL=5.00 mmol/L.
- [f]To convert mg/dL triglyceride to mmol/L, multiply mg/dL by 0.0113. To convert mmol/L triglyceride to mg/dL, multiply mmol/L by 88.6. Triglyceride of 159 mg/dL=1.80 mmol/L.
- [g]HDL=high-density lipoprotein cholesterol.
- [h]LDL=low-density lipoprotein cholesterol.
- [i]To convert mg/dL glucose to mmol/L, multiply mg/dL by 0.0555. To convert mmol/L glucose to mg/dL, multiply mmol/L by 18.0. Glucose of 108 mg/dL=6.0 mmol/L.

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