Diabetes Nutrition and Complications Trial

Trends in nutritional pattern between 1993 and 2000 and targets of diabetes treatment in a sample of Spanish people with diabetes

THE DIABETES AND NUTRITION STUDY GROUP OF THE SPANISH DIABETES ASSOCIATION*

Nutrition therapy plays an important role in the treatment of diabetes and must be based on regular alimentary diet habits, lifestyle, and personal preferences in order to attain the goals of diabetes management (1–5). If goals are not met, changes must be made in overall diabetes care, including the nutrition plan. In 1993, the usual diet of diabetic patients in Spain was a high-fat diet (>40%), basically rich in monounsaturated fatty acids (>50% of total fat intake) and poor in carbohydrates (<40%) (6). Despite this, between 60 and 85% of the diabetic patients reached a near-optimal metabolic control according to old targets (6,7), and a low cardiovascular morbidity/mortality (8,9) and a low prevalence of microvascular complications (10–12) have been reported in the Spanish population. Since 1993, treatment goals have been modified according to present evidences and lower targets of metabolic control may be achieved.

The Diabetes Nutritional Complications Trial is a prospective, observational, population-based, multicenter study. In this investigation, we report the changes in the nutrition pattern (based on 7-day food diaries) that occurred between 1993 and 2000 and their connection to diabetes treatment goals in a sample of diabetic patients from Spain.

RESEARCH DESIGN AND METHODS — A total of 192 diabetic patients, 93 type 1 diabetic patients (41 men, 34.7 ± 15.1 years of age, and disease duration of 20.1 ± 9.5 years; 52 women, 36.7 ± 12.8 years of age, and disease duration of 18.9 ± 10.1 years) and 99 type 2 diabetic patients (42 men, 66.6 ± 8.6 years of age, and disease duration of 17.1 ± 7.7 years; 57 women, 66.3 ± 11.0 years of age, and diabetes duration of 18.0 ± 8.6 years) attending the four outpatient diabetes clinics between 1993 and 2000 completed the study. The requirements and a wide description of the experimental design have been previously reported (6).

RESULTS — Table 1 shows the median daily intakes (Q1–Q3) of energy and macronutrients, the clinical and laboratory data in both type 1 and type 2 diabetic patients in the year 2000, and the change in relation to 1993. A tendency to reduce protein consumption (between −1.4 and −6.9%) and to increase total fat consumption (between 1.0 and 8.2%) due to an increase in intake of poly- and monounsaturated fatty acids (between 11.9 and 21.6% and 4.0 and 20.7%, respectively) was observed.

There was no correlation between the day-to-day variability in carbohydrate intake and HbA_{1c} or other diabetes control parameters.

Of the diabetic patients, 85% had an optimal HDL cholesterol level, 95% had a non-HDL cholesterol value <130 mg/dl, 86% had a triglycerides level <150 mg/dl, and 58% had an HbA_{1c} value <7.5%. The percentage of diabetic patients with an adequate metabolic control has increased since 1993. Excluding diabetic patients treated with lipid-lowering drugs, and/or blood pressure–lowering drugs, the percentage of diabetic patients with LDL cholesterol <100 mg/dl and with systolic blood pressure <130 mmHg and diastolic blood pressure <80 mmHg increased up to 64.8, 57.1, and 49.4%, respectively.

CONCLUSIONS — The nutrition pattern in people with diabetes in Spain remains high in fat consumption, mainly monounsaturated fatty acids, and low in carbohydrate intake. Usual diet is characterized by a low carbohydrate intake, mainly vegetables, fruits, and cereals but fewer legumes, and a high intake of olive oil, a moderately high intake of fish, and a moderate intake of saturated lipids, as well as a low intake of ethanol. A tendency to increase the consumption of mono- and polyunsaturated fatty acids and to decrease protein consumption have been observed. However, consumption of saturated fat is still excessive, but monounsaturated fatty acids–to–saturated fatty acids and polyunsaturated fatty acids–to–saturated fatty acids ratios have increased. These trends are associated with favorable changes in diabetes metabolic control parameters. Likewise these changes in monounsaturated fatty acids–to–saturated fatty acids and polyunsaturated fatty acids–to–saturated fatty acids ratios have been associated to salutary cardiovascular changes (13–16).

More than 80% of diabetic patients comply with the recommendation of consuming >60% of daily calories as carbohydrate and monounsaturated fatty acid, but <10% of diabetic patients have adhered to the recommendation of reducing saturated fat consumption to <10% of daily calories consumption, and <8% consume under 300 mg/day cholesterol. Despite this, many people with diabetes

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Table 1 —*Nutrient intake, clinical characteristics, and laboratory data of study subjects*

	Type 1 diabetes						Type 2 diabetes					
	Men	Change	CV	Women	Change	CV	Men	Change	CV	Women	Change	CV
n	41			52			42			57		
Energy (kcal/day)	2,290 (1,947–2,635)	7.5	18	1,736 (1,482–2,203)	6.8	18	1,936 (1,654–2,239)	−0.9	19	1,581 (1,325–1,773)	1.4	17
Carbohydrate (%)	38.7 (34.3–43.8)	−1.7	18	37.2 (33.7–42.0)	−1.1	21	37.9 (34.8–42.4)	4.8	16	38.4 (34.0–43.1)	0.3	19
Grams	218 (169–271)	10.1	23	162 (132–211)	5.1	24	181 (156–213)	2.7	26	146 (118–183)	1.9	23
Protein (%)	17.7 (16.3–21)	−5.0	21	18.1 (16.4–20.4)	−4.2	22	19.4 (18.022.4)	−6.9	17	21.0 (19.4–24.3)	−1.4	18
Grams	106 (91–117)	0.2	23	77 (69–89)	0.5	25	95 (81–104)	−9.7	22	82 (73–97)	−2.6	20
Total fat (%)	40.1 (36.6–44.8)	1.0	16	42.7 (39.9–47.0)	8.2	18	37.8 (33.4–42.7)	3.2	16	39.3 (35.1–42.1)	5.5	20
Grams	99 (85–121)	10.5	28	79 (73–107)	17.0	28	82 (68–94)	2.8	26	68 (56–81)	8.1	30
SFAs (%)	31.6 (27.2–43.7)	5.0	31	32.6 (26.1–41.0)	17.0	33	30.1 (23.2–36.9)	−4.3	33	30.8 (24.6–40.0)	7.3	38
MUFAs (%)	54.5 (44.7–66.1)	20.7	31	54.8 (48.3–70.6)	19.7	32	56.2 (45.2–68.5)	4.0	28	56.0 (43.1–66.2)	17.4	33
PUFAs (%)	14.5 (10.5–17.0)	13.0	42	13.0 (9.8–16.2)	16.5	39	13.2 (10.1–17.1)	21.6	33	12.1 (9.9–14.6)	11.9	38
MUFAs/SFAs	1.72 (1.27–1.98)	38.7	49	1.69 (1.35–2.13)	14.5	42	1.87 (1.52–2.01)	39.3	39	1.89 (1.53–2.13)	32.4	41
PUFAs/SFAs	0.45 (0.38–0.55)	34.5	41	0.41 (0.38–0.50)	11.1	36	0.44 (0.36–0.56)	44.3	36	0.40 (0.36–0.49)	36.5	44
Cholesterol (mg)	452 (366–566)	3.9	52	333 (278–393)	0.9	54	362 (312–434)	−9.7	52	297 (218–374)	0.8	56
Fiber (g)	19.1 (13.0–24.1)	3.8	43	14.7 (11.9–18.5)	−13.5	46	19.6 (15.5–28.3)	−1.6	37	18.6 (14.3–20.8)	−6.2	40
Alcohol (%)	5.0 (0–11.0)	5.2	86	0.0 (0.0–2.2)	0.2	82	4.5 (0.0–11.6)	0.7	88	0.0 (0.0–2.5)	−0.1	92
Body weight (kg)	71.6 (66.4–78.5)	7.4		60.0 (54.5–68.3)	4.5		75.3 (71.2–86.5)	1.6		70.9 (67.0–76.5	1.7	
BMI (kg/m^2)	24.1 (22.5–26.8)	2.0		23.7 (21.5–26.9)	1.7		30.5 (27.2–34.5)	0.5		32.8 (30.1–38.5)	3.8	
Waist perimeter (cm)	84 (80–93)	5.5		73 (70–82)	3.2		104 (92–122)	5.1		99 (89–106)	3.2	
Waist-to-hip ratio	0.89 (0.84–0.92)	0.0		0.79 (0.71–0.83)	0.0		0.97 (0.89–1.08)	0.0		0.88 (0.80–0.94)	−0.0	
Systolic blood pressure (mmHg)	125 (110–135)	4.2		120 (110–133)	1.7		140 (140–160)	4.3		140 (136–160)	−2.0	
Diastolic blood pressure (mmHg)	77 (70–80)	3.7		75 (65–80)	4.3		80 (79–86)	1.2		80 (76–85)	4.7	
HbA_{1c} (%)	6.9 (6.1–8.0)	−1.1		7.5 (6.3–8.6)	−0.7		6.4 (5.5–8.2)	−1.1		6.3 (5.8–8.6)	−1.2	
Cholesterol (mg/dl)	188 (154–206)	−6.1		208 (167–229)	6.1		193 (169–217)	−20.3		209 (188–221)	−8.9	
HDL cholesterol (mg/dl)	60 (53–65)	5.7		69 (58–79)	11.5		58 (48–65)	13.2		61 (53–69)	12.8	
LDL cholesterol (mg/dl)	110 (78–138)	−1.6		118 (92–140)	−5.3		111 (84–134)	−35.9		116 (105–137)	−17.4	
Triglycerides (mg/dl)	74 (60–100)	−1.2		58 (43–77)	−22.8		98 (82–138)	−13.2		95 (73–128)	−8.3	
Non-HDL cholesterol (mg/dl)	125 (92–145)	−0.3		135 (96–164)	−6.2		136 (102–158)	−18.5		143 (113–178)	−15.6	
Apolipoprotein A1	143 (126–156)	NV		171 (143–189)	NV		144 (132–156)	NV		157 (145–172)	NV	
Apolipoprotein B	73 (56–97)	NV		82 (68–95)	NV		105 (88–118)	NV		100 (84–115)	NV	
Lipoprotein(a) mg/dl	11.6 (9.6–24)	NV		10.6 (9.6–24.5)	NV		16.4 (9.6–48.3)	NV		17.2 (9.6–85)	NV	
Albumin-to-creatinine ratio <30 mg/g	35 (85.3)	0		43 (82.7)	5.8		24 (57.1)	−14.3		44 (77.2)	−8.8	

Data are median (Q1–Q3) and *n* (%). CV, coefficient of variation; MUFAs, monounsaturated fatty acids; NV, not evaluated in 1993; PUFAs, polyunsaturated fatty acids; SFAs, saturated fatty acids. Change was calculated as (value in year 2000 − value in year 1993) × 100/value in year 1993.

in Spain still have near-optimal metabolic control values.

However, <30% present LDL cholesterol levels <100 mg/dl. Recently, the non–HDL cholesterol level has emerged as an alternative for LDL cholesterol in order to identify diabetic patients at cardiovascular risk (17–19). Likewise, it has been reported that both apolipoprotein B and non-HDL cholesterol can more precisely identify diabetic patients at cardiovascular risk than LDL cholesterol (20–22). Data obtained from our report reinforce this hypothesis. According to apolipoprotein B and non–HDL cholesterol levels, >85% of the diabetic patients studied would be at low cardiovascular risk, as would be expected considering the epidemiological data of cardiovascular morbidity previously reported (8,9). One basic goal of the nutritional treatment in people with diabetes is to help them adapt the treatment to the changes in their lifestyle. Even though we have not analyzed the adaptation of food consumption to the changes in lifestyle, the existence of high macronutrient variation rate values assures that diabetic patients present substantial day-to-day variability in their food consumption, which guarantees that the 7-day food diary was being filled out while the patients were living their habitual lifestyle. Moreover, this variability in the day-to-day carbohydrate consumption was not associated with a deterioration in glycemic control, thus suggesting proper adaptation.

Based on these data, the Spanish Diabetes Association recommends not modifying the usual diet of diabetic patients, but rather encouraging the decrease of saturated fat consumption.

APPENDIX

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