

Effects of lifestyle education on Type 2 diabetes with an emphasis on a traditional Japanese diet



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Practice Points

- Lifestyle modification, including education, diet and exercise, is an important factor in disease management programs aimed at combating Type 2 diabetes.
- This study evaluated the benefits of a lifestyle education program for 92 previously untreated Japanese outpatients with Type 2 diabetes (43 obese and 49 non-obese), with an emphasis on a traditional Japanese diet.
- Lifestyle education, including consumption of a traditional Japanese diet, improved total energy consumption, BMI, glycemic control and cardiovascular risk factors.
- The educational program also produced positive behavioral changes in patients.
- Formal educational training regarding lifestyle improvement, including the consumption of a traditional Japanese diet, has a positive impact on patients with Type 2 diabetes.

SUMMARY **Aims:** Lifestyle measures are central to disease management strategies aimed at combating the increased prevalence of Type 2 diabetes. The aim of this study was to evaluate the effects of lifestyle education, with an emphasis on a traditional Japanese diet, in patients with Type 2 diabetes. **Methods:** An educational program for previously untreated outpatients with Type 2 diabetes mellitus was initiated, reinforcing the benefits of a healthy lifestyle and particularly a traditional Japanese diet. Following a Basic Diabetes Education protocol, nutrient intake, exercise and cardiovascular risk factors were measured at 0, 3 and 6 months. **Results:** 92 patients received educational training (43 obese [BMI ≥ 25 kg/m²] and 49 non-obese patients [BMI < 25 kg/m²]), completed assessment at all time-points, and demonstrated that the Basic Diabetes Education protocol produced positive behavioral changes and an improvement in total energy consumption, BMI, glycemic control (significantly lower HbA1c and postprandial plasma glucose) and cardiovascular risk factors (lipid profile). **Conclusion:** Our results provide support for formal educational training regarding lifestyle improvement, including a traditional Japanese diet, in patients with Type 2 diabetes mellitus.

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The increased prevalence of Type 2 diabetes mellitus is becoming a global 'epidemic' and places a huge burden on healthcare systems in most industrialized societies. This also applies to Japan, and it is one of the most serious health issues facing the country [1]. The International Diabetes Federation recommend a three-step approach for the management of Type 2 diabetes mellitus patients based upon identifying those at risk, measuring the risk and applying appropriate intervention [2]. Lifestyle modification is central to this approach and a number of studies have highlighted the benefits of strict individualized diet and exercise programs [3-5]. This current article outlines an open-label, observational assessment that evaluated the impact of an educational program (Basic Diabetes Education; BDE) specifically designed for Japanese patients with Type 2 diabetes not receiving antidiabetic therapy.

Research design & methods

From 1997 to 2005, all previously untreated outpatients with Type 2 diabetes (patients with the following symptoms: fasting blood glucose ≥ 140 mg/dl; casual blood glucose ≥ 200 mg/dl; patients with or without symptoms: 2 h value of 75 g oral glucose tolerance test ≥ 200 mg/dl) entering the Okada Medical Clinic were invited to participate in a BDE program, reinforcing the benefits of a healthy lifestyle and particularly a traditional Japanese diet, which included the following:

- Increased intake of vegetables, seaweed, mushrooms and fruits, with fruit consumption in amounts equivalent to, at most, 80 kcal/day.
- Carbohydrate consumption in amounts equivalent to approximately 60% of the daily energy requirement and ingested in the form of rice, barley/wheat, soba, potatoes, beans and so on.
- Protein consumption in amounts of 1.4 g/kg standard bodyweight, with sources shifting from meat to soybeans, fish and shellfish. Daily consumption of egg (one egg/day) and dairy products, such as cow's milk (180 ml/day) or yogurt (180 g/day), was considered to be essential for all subjects.
- Lipid consumption in amounts equivalent to 25% or less of the daily energy requirement, ingested primarily in the form of vegetable fat.
- Dining out, snacking between meals, and alcohol and desserts were to be reduced.
- Foods to be well chewed and eaten slowly (25 min/meal).

- Eating after 9 pm to be reduced; intake of fat at night avoided.

- Brisk daily walks: 3 km for 30 min per day.

The aim of the program was to determine the nutritional habits and exercise levels of each participant. Individual standard bodyweights were also measured to calculate daily energy requirements. All subjects were invited to participate in a BDE protocol that involved a single session run by a physician plus allied healthcare professionals using educational texts produced by the Okada Medical Clinic, and ongoing training exercises, formally followed up on a monthly basis. The BDE protocol covers three key areas: concepts and knowledge necessary for self-management; motivation; and aid. Information regarding nutrition was managed by a dietician and exercise by a physical exercise technician. Following the educational session, nutrient intake, exercise and cardiovascular risk factors were measured at 0, 3 and 6 months (by formal interview and analysis). Compliance was evaluated, by formal interview, at 3 and 6 months. Statistical analysis was performed using the paired t-test, with a $p < 0.05$ being considered as statistically significant.

Results

Between 1997 and 2005, 846 Japanese adults with Type 2 diabetes mellitus were managed at the Okada Medical Clinic as outpatients. Of these 846 patients, 95 patients with mild diabetes had received no prior antidiabetic medications and, as the first step in disease management, they underwent educational training. A total of 92 subjects completed all three time-points and they were divided into obese ($n = 43$; BMI ≥ 25 kg/m²) and non-obese groups ($n = 49$; BMI < 25 kg/m²).

Results regarding diet and exercise demonstrated that the BDE protocol produced positive behavioral changes in patients with Type 2 diabetes mellitus and these were paralleled by improvements in total energy consumption, BMI, glycemic control (significantly lower HbA1c and postprandial plasma glucose) and cardiovascular risk factors (improved lipid profile) (Table 1). The decrease in BMI correlated significantly with changes in HbA1c, triglycerides, LDL-C:HDL-C ratio, HOMA-IR, fasting immunoreactive insulin and postprandial plasma glucose. By contrast, there was no correlation between the decrease in HOMA-IR and changes in HbA1c, triglycerides and LDL-C:HDL-C ratio, although it was correlated with BMI and postprandial plasma glucose

Table 1. Comparison of cardiovascular risk factors before and 3 and 6 months after educational training (mean ± standard deviation).

	BMI (kg/m ²)	HbA1c (mmol/mol); %	TG (mmol/l)	LDL-C/HDL-C	FIRI (pmol/l)	HOMA-IR	PPPG (mmol/l)	BP (mmHg)
BMI <25; n = 49[†]								
Before intervention	22.57 ± 1.42	72 ± 18; 8.71 ± 1.72	2.88 ± 1.41	2.60 ± 1.02	43.06 ± 26.39	2.38 ± 1.29	14.16 ± 4.35	123.35 ± 13.20/ 71.25 ± 11.22
3 months after intervention	21.71 ± 1.49; p < 0.0001	52 ± 10; 6.95 ± 0.96; p < 0.0001	1.66 ± 0.82; p = 0.0185	2.27 ± 0.86; p = 0.0016	34.03 ± 16.53; p = 0.0456	1.65 ± 1.12; p = 0.0394	8.15 ± 2.22; p = 0.0009	120.55 ± 14.26/ 70.45 ± 10.54 ns/ns
6 months after intervention	21.50 ± 1.46; p < 0.0001	49 ± 11; 6.60 ± 1.02; p < 0.0001	1.43 ± 0.53; p = 0.0597	2.24 ± 0.84; p = 0.0007	30.35 ± 16.60; p = 0.0001	1.34 ± 0.72; p < 0.0001	8.18 ± 2.50; p = 0.0053	121.44 ± 12.97/ 69.17 ± 11.10 ns/ns
BMI ≥25; n = 43[‡]								
Before intervention	27.88 ± 2.86	76 ± 21; 9.09 ± 1.90	2.78 ± 0.96	2.87 ± 0.72	57.30 ± 38.20	3.25 ± 1.97	13.51 ± 4.47	123.21 ± 10.82/ 72.50 ± 10.66
3 months after intervention	26.07 ± 2.27; p < 0.0001	48 ± 11; 6.57 ± 1.04; p < 0.0001	1.55 ± 0.88; p < 0.0001	2.76 ± 0.62; p = 0.2385	39.38 ± 16.32; p = 0.0269	1.77 ± 1.02; p < 0.0032	8.16 ± 2.77; p = 0.0001	119.54 ± 12.10/ 71.23 ± 11.68 ns/ns
6 months after intervention	26.22 ± 2.94; p < 0.0001	47 ± 17; 6.46 ± 1.54; p < 0.0001	1.70 ± 0.66; p = 0.0014	2.55 ± 0.75; p = 0.1585	40.42 ± 23.54; p = 0.0364	1.76 ± 1.24; p = 0.0098	7.61 ± 2.21; p = 0.0004	118.10 ± 11.86/ 69.33 ± 8.75 ns/ns

[†]A total of 49 nonobese patients (40 not receiving antihypertensive therapy and nine treated with a calcium antagonist).

[‡]A total of 43 obese patients (28 not receiving antihypertensive therapy and 15 treated with a calcium antagonist).

BP: Blood pressure (BMI <25 [n = 40], BMI ≥25 [n = 28]); FIRI: Fasting immunoreactive insulin; HbA1c: Hemoglobin A1c; HDL-C: High-density lipoprotein cholesterol; HOMA-IR: Homeostasis model assessment for insulin resistance; LDL-C: Low-density lipoprotein cholesterol; ns: Not significant; PPPG: Postprandial plasma glucose; TG: Triglyceride.

decreases. The significant correlation between the magnitude of improvement in metabolic and glycaemic parameters, and weight loss, in both obese and non-obese patients, highlight its importance for the management of Type 2 diabetes mellitus.

Discussion

Current pharmacological approaches to the prevention and/or management of diabetes have their limitations [1,2] and lifestyle education programs [6–8] have become increasingly important in overcoming some of these shortcomings. The current study evaluated the effects of lifestyle education, with an emphasis on a traditional Japanese diet, in patients with Type 2 diabetes. Total energy intake at the time of detection of diabetes was 1.7-times the calculated standard energy requirement for our subjects. The amount of oil/fat and fat-rich foods was 2.4-times the calculated standard, the amount of vegetables, seaweed and mushrooms was 0.6-times and the amount of seasoning was 1.5-times the standard amounts of these food categories. Furthermore, alcohol and desserts were consumed in amounts equivalent to 660 kcal/day, and the total daily intake of fatty acids was 1.4-times the standard amount. The percentage of patients who exercised less than four times per week (insufficient to prevent the onset of Type 2 diabetes mellitus) was very high; 83.6%. Thus, a marked tendency for subject lifestyle factors to favor high caloric consumption and lack of exercise was clearly evident.

The results of the current study demonstrate that consuming traditional Japanese food facilitates the intake of appropriate amounts of carbohydrate from grains (i.e., rice, barley/wheat and soba), potatoes and beans, and appropriate amounts of protein from soybeans, fish/shellfish, eggs and so on. Japanese meals are also rich in seasonal vegetables and fruits that contain

antioxidants and are low in trans-fatty acids. Fish, which is a major source of protein in Japanese dishes, is known to reduce the risk of stroke and has contributed to keeping the incidences of obesity, Type 2 diabetes mellitus and coronary heart disease very low in the Japanese population.

The significant correlation observed between decreased BMI and changes in HbA1c, triglycerides, LDL-C:HDL-C ratio, HOMA-IR, fasting immunoreactive insulin and postprandial plasma glucose indicate that the amount of lifestyle improvement is significantly related to controlling diabetes mellitus and to reducing the risk of arteriosclerosis.

While this study has some limitations relating to potential bias inherent in the pre- or post-comparison design and lack of control group, overall, the results provide support for instituting formal educational training regarding lifestyle improvement, including a traditional Japanese diet, in patients with Type 2 diabetes mellitus in everyday practice.

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