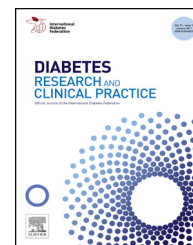


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Brief report

Adherence to lifestyle recommendations is associated with improved glycemic control and improved blood lipid levels in Korean adults with type 2 diabetes



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ABSTRACT

We explored the association between the degree of adherence to recommendations and diabetes management in Korean adults who had type 2 diabetes for an average of 8 years. Subjects who met five or more lifestyle recommendations showed significantly lower blood lipid parameters and glycated hemoglobin than those who did not.

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Diabetes mellitus is a chronic disease that requires continuous medical care and ongoing patient self-management to reduce the risk of long-term complications [1]. Dietary or lifestyle interventions play a pivotal role in the therapeutic strategy to maintain good glycemic control and prevent complications in patients with type 2 diabetes.

Several studies have been conducted in the general population regarding compliance with nutrition recommendations but few similar studies have been conducted in patients with diabetes. Rivellese et al. [2] examined adherence to 10 dietary recommendations in Italy and indicated that

compliance was unsatisfactory in terms of dietary composition. Eilat-Adar et al. [3] reported lower adherence to dietary recommendations in Native Americans and other US adults with diabetes. Munoz-Pareja et al. [4] reported the association between diet with nutritional recommendations in Spain and found that only half of subjects followed major dietary recommendations.

As diet is a substantial part of lifestyle, adherence to both dietary recommendations and health-related behavior is important. Recent research has indicated that a healthy lifestyle that combines a prudent diet, regular physical

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activity, maintenance of a healthy weight, moderate alcohol consumption, and no smoking decreases the risk for cardiovascular disease, diabetes, and metabolic syndrome [5–7]. However, these lifestyle studies were conducted in the general population and not in patients with diabetes. Furthermore, most studies were conducted in western populations but type 2 diabetes is a growing health problem in Asia [8] and therefore studies on Asian populations are necessary.

The objective of this study was to investigate the adherence to lifestyle recommendations and its association with glycaemic control and blood lipid parameters in Korean people with type 2 diabetes.

1. Subjects and methods

This study was a comparative analysis of adults >30 years old who participated in the Fourth Korean National Health and Nutrition Examination (KNHANES) (2007–2008). A total of 726 subjects were defined as having type 2 diabetes based on criteria of fasting glucose ≥ 126 mg/dl (7.0 mmol/l), anti-diabetes treatment, or previously diagnosed diabetes. We excluded subjects who were newly diagnosed or who had missing data, so our final sample was 516 participants with known diabetes. The Fourth KNHANES has been detailed elsewhere [9] and demographic, biochemical, and dietary variables from that survey were used in this study.

Lifestyle recommendations were based on treatment guidelines for diabetes by the Korean Diabetes Association [10] and Korean Dietary Reference Intakes [11] and composed of six dietary recommendations and four health-related behavioral recommendations.

The dietary recommendations included intake of carbohydrates, fat, whole grains, fruit, vegetables, low-fat milk, and dairy. Dietary data were obtained from 24 h recall and a food frequency questionnaire. The recommendation for

carbohydrate intake was 55–70% of total energy and dietary fat intake was 15–25% of total energy intake [11]. Subjects who met the recommendations were regarded as adherent and others were regarded as nonadherent. Subjects whose frequencies of consuming whole grains, fruit, vegetables, low-fat milk, and dairy were in the top tertile among participants were regarded as meeting the recommendations, as there were no cut-off values.

Health-related behavioral recommendations included weight management, drinking alcohol, smoking, and physical activity, and data were obtained from anthropometric measurements and health-related questionnaires. Recommendations were a body mass index (BMI) < 23 kg/m², < 1 –2 alcoholic drinks per day, and no smoking. The physical activity recommendation was moderate intensity activity more than 5 times per week for 30 min per day.

Biochemical information included blood glucose, insulin, glycated hemoglobin (HbA1C), serum triglycerides, high density lipoprotein-cholesterol, and total cholesterol. HbA1c $< 7.0\%$ (53 mmol/mol) was defined as achieving the glycemic goal set by the American Diabetes Association [1]. The covariates used were age, gender, education, income, diabetes duration, and diabetes treatment.

2. Results

Among ten lifestyle recommendations, 24.2% of subjects met four recommendations, 22.9% met three recommendations, and 17.8% met two recommendations. Overall, 29.5% of the subjects adhered to more than five recommendations. General and biochemical information is presented Table 1 by degree of adherence. No significant differences were observed for age, diabetes duration, or diabetes treatment between the groups. However, subjects who adhered to five or more recommendations had a significantly lower BMI, waist circumference,

Table 1 – General and biochemical information according to the degree of adherence to ten lifestyle recommendations in people with known type 2 diabetes.

	Adherence < 5 (n = 364) (Mean \pm SD)	Adherence \geq 5 (n = 152) (Mean \pm SD)	P
Age (years)	63.0 \pm 10.5	62.0 \pm 10.5	NS
Gender (%), male	50.5	37.5	0.0068
DM duration (years)	8.3 \pm 8.0	9.0 \pm 8.4	NS
DM treatment (%) ^a	80.8	82.2	NS
Body mass index (kg/m ²)	25.3 \pm 3.2	24.2 \pm 3.1	0.0001
Waist circumference (cm)	88.9 \pm 8.6	85.5 \pm 8.8	0.0001
Serum triglyceride (mg/dl) ^b	174.0 \pm 116.3	149.1 \pm 81.8	0.0054
Serum HDL-cholesterol (mg/dl) ^b	43.0 \pm 9.5	44.2 \pm 10.5	NS
Serum total cholesterol (mg/dl) ^b	192.9 \pm 44.3	184.4 \pm 38.0	0.0336
Blood glucose (mg/dl) ^b	142.4 \pm 48.7	137.6 \pm 46.4	NS
Blood insulin (μ U/ml) ^b	11.3 \pm 6.7	10.5 \pm 5.0	NS
HbA1c (% , mmol/mol) ^b	7.5 \pm 1.6	7.2 \pm 1.5	0.0112
HbA1c < 7.0 (%)	58 \pm 17	55 \pm 16	0.0562

NS, not significant; DM, diabetes mellitus.

^a DM treatment included oral hypoglycemic agents or insulin.

^b All blood values were adjusted for age, gender, education, income, diabetes duration, and diabetes treatment.

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