
Special Report



Principles of Nutrition and Dietary Recommendations for Individuals with Diabetes Mellitus: 1979

AMERICAN DIABETES ASSOCIATION

In 1971 the Committee on Food and Nutrition of the American Diabetes Association published a special report entitled "Principles of Nutrition and Dietary Recommendations for Patients with Diabetes Mellitus." Publication of the report was prompted by new and emerging information regarding effects of diet on blood glucose concentration in diabetic persons and by information relating aberrations of blood lipid levels, particularly cholesterol, with atherosclerosis in the general population. The present report updates these original principles and recommendations and is based on information accumulated since 1971.

PRINCIPLES

1. For all healthy individuals, nutritional requirements are fundamentally the same, varying primarily in amounts during the various stages of the life cycle. The dietary recommendations for diabetic persons are, in most respects, the same as for nondiabetic persons and are based on sound principles of nutrition.* Ordinarily, the nutrient needs of diabetic persons may be met without the use of special "diabetic" or "diabetic" foods.

2. In insulin-dependent diabetic individuals and in some non-insulin-dependent diabetic persons treated with oral glucose-lowering agents, special precautions regarding amount, distribution, and timing of food intake are required to avoid inordinate swings in blood glucose and potentially dangerous episodes of hypoglycemia.

3. In non-insulin-dependent, obese, diabetic persons, a professionally supervised weight control and exercise program with strong reinforcement by qualified health-care professionals is of primary importance if long-term change in life-

style is to be maintained. Maintenance of a normal amount of body fat is the best method of treating this type of diabetes and may help control the hypertension and hyperlipidemia commonly found in these individuals.

4. Education of diabetic persons regarding basic nutrition, food selection and preparation, daily food plans, and the nutrient composition of food is the key to achieving an effective meal plan. Each diabetic person should have the opportunity to discuss the reasons for the diet and to set diet goals with a professional diet counselor working closely with a physician and other health-care professionals. This must be a continuing educational process conducted in an understanding and nonjudgmental manner in which psychological, physical, and socioeconomic factors are considered in the development of each individual's daily food plan. The use of "pre-printed handout" diet plans will not achieve these objectives and is strongly discouraged.

5. Dietary recommendations should be as flexible as possible. The widest possible options in food choices and distribution of food intake should be given, consistent with fundamentals of good nutrition and with the approval of the attending physician. The personality, life-style, and physical conditioning of the diabetic person should be considered. A flexible meal plan may be more practical and more acceptable for less compulsive persons, while a rigid dietary regimen may be suitable for compulsive persons. It is imperative that an appropriate family member also understand and be able to implement the diabetic person's daily meal plan, should this be necessary. Every effort should also be made to work with family members so that the meal plan neither creates conflicts within the family nor disrupts usual family activities.

6. Insulin-dependent diabetic persons may find it easier to adapt their insulin regimens than to change basic eating habits. A suitable meal plan acceptable to these individuals should be identified and the insulin treatment integrated with the dietary program.

* Food and Nutrition Board, National Academy of Sciences—National Research Council Recommended Daily Dietary Allowances, Revised 1979.

GOALS OF DIET THERAPY FOR INDIVIDUALS WITH DIABETES MELLITUS

1. Improve the overall health of the patient by attaining and maintaining optimum nutrition.
2. Attain and/or maintain an ideal body weight.
3. Provide for normal physical growth in the child; provide adequate nutrition for the pregnant woman and, hence, for her fetus; provide adequate nutrition for lactation needs if she chooses to breast-feed her infant.
4. Maintain plasma glucose as near the normal physiologic range as possible.
5. Prevent and/or delay the development and/or progression of cardiovascular, renal, retinal, neurologic, and other complications associated with diabetes, insofar as these are related to metabolic control.
6. Modify the diet as necessary for complications of diabetes and for associated diseases.
7. Make the diet prescription as attractive and realistic as possible. Provide each patient with an individualized educational and follow-up program. Repeat visits serve to extend and clarify the instruction, to provide assurance, and to check progress.

Diabetes now appears to represent a number of different diseases, all of which are characterized by an abnormally high circulating blood glucose concentration. The two principal clinical categories of diabetes are the insulin-dependent (usually thin or normal weight, ketosis prone) and the non-insulin-dependent, obese subtype[†] (usually ketosis resistant).

In each of these categories, dietary management plays a primary role in control of the blood glucose concentration.

In the discussion that follows, dietary management in general is considered as well as the special requirements of individuals within these two major categories of diabetes.

GENERAL CONSIDERATIONS

1. Although it is not certain that restriction of dietary saturated fat and cholesterol and replacement with unsaturated fat will slow the progression of atherosclerosis, it is a reasonable expectation. Therefore, dietary sources of fat that are high in saturated fatty acids and foods containing cholesterol should be restricted.

2. There is evidence suggesting that dietary fiber may be important in preventing some colon abnormalities and, possibly, colon carcinoma. It also has been reported to lower postmeal plasma glucose in diabetic persons. Although the long-term effects of dietary fiber in diabetic persons are unknown, it seems reasonable that the amount of food fiber be estimated in any given diet. Wherever acceptable to the patient, natural foods containing unrefined carbohydrate with

fiber should be substituted for highly refined carbohydrates, which are low in fiber. Changes in fiber content of the diet should be brought to the attention of the physician, since they may change insulin requirements.

3. All nutritionally imbalanced ("fad") diets should be avoided. In particular, commercially available high protein mixtures that contain low quality protein for use in modified starvation diets should be avoided. Prolonged use of these products has been associated with death from cardiac arrhythmias.

4. Lacto and lacto-ovo vegetarian diets can be nutritionally adequate. But if one or both of these food groups is also omitted, nutritional adequacy is jeopardized. It may be necessary to provide iron, calcium, zinc, iodine, and vitamin D. Pure vegetarian diets will need to be supplemented with vitamin B12 and, perhaps, iron and calcium.

5. In general, the average American eats more salt (NaCl) than is necessary or desirable. In some cases, prolonged use of excessive amounts may lead to hypertension. Modest restriction of salt intake should be considered in well-controlled, diabetic persons without other medical problems. It should also be considered in the treatment of diabetic persons with hypertension. However, this decision should be made only by the attending physician and only after a thorough consideration of the individual's needs. For example, in poorly controlled persons or in those with renin-angiotensin-aldosterone insufficiency, sodium restriction could be harmful.

6. The amounts of fructose, xylitol, sorbitol, and mannitol acceptable in a food plan for diabetic persons is uncertain at present. In normal individuals they induce only a modest rise in plasma glucose concentration. However, their long-term effects of plasma glucose control and on metabolism in diabetic individuals have not been well studied. At the present time, there is not enough evidence either to accept or to reject the use of these nutritive sweeteners by diabetic persons. This is also the status of available nonnutritive sweeteners.

7. With the approval of the responsible physician, alcoholic beverages in prescribed amounts may be consumed by diabetic persons. The type and quantity of calories present should be counted and included in the diet plan as with other foods. The caloric value of alcohol is approximately 7 cal/g but it has no other nutritional value. Its metabolic fate is similar to fats.

SPECIAL DIETARY CONSIDERATIONS IN INSULIN-DEPENDENT DIABETIC PERSONS

Diet is important in control of plasma glucose abnormalities and prevention of hypoglycemia. Whether it plays a role in preventing or delaying the development of neuropathy, microvascular disease, or atherosclerosis in these patients is uncertain. Nevertheless, effective insulin treatment requires a stand-

[†] In the proposed classification of idiopathic diabetes recommended by the National Diabetes Data Group, National Institutes of Health, this type of diabetes would be Class IIb.

ardized daily regimen of food intake. The following variables must be considered when planning a diet for these individuals: (1) the timing of meals, (2) diet composition, (3) energy content of the diet, and (4) level of physical activity.

Regularity of meals. The time of day at which meals are taken and the number of meals eaten each day should be dictated by individual needs, i.e., life-style, physical activity, and administered insulin. In persons taking insulin, regularity of food intake is particularly important in maintaining good metabolic management. The need for maintenance of a regular eating and exercise pattern should be strongly emphasized in all diabetic persons receiving insulin or oral glucose-lowering agents. Vigorous exercise is seldom contraindicated in these individuals. With improved use of glucose by the exercising muscles and a more rapid rate of insulin release into the blood, an increase in food or a decrease in insulin dosage may be indicated. If vigorous physical activity is known to induce hypoglycemia, ingestion of a carbohydrate-rich snack just prior to the exercise period often is the simplest means of avoiding a hypoglycemic reaction.

Diet composition. For most insulin-dependent diabetic persons, a nutritionally adequate diet is satisfactory, with the exception that the amounts of glucose and glucose-containing disaccharides (sucrose, lactose) are restricted, particularly when added to the usual calorie intake. Protein of appropriately good quality should account for 12–20% of total energy intake. Carbohydrate should usually account for 50–60% of total energy intake, and fat should make up the difference. The level of saturated fatty acids in the diet should be decreased to less than 10% of the total calories; polyunsaturated fatty acids should supply up to 10% of the total calories, and the remainder of ingested fat is derived from monounsaturated sources.

The above percentages are general recommendations and not rigid requirements. It is more appropriate to adapt the dietary plan to the individual's usual diet, provided it meets the nutritional needs of that individual. Day-to-day consistency in amounts and distribution of carbohydrates, fat, and protein should be a major goal. If the only diet acceptable by the patient is unusual in content or daily caloric distribution or if dietary consistency is not possible, communication among the patient, diet counselor, and physician is imperative.

Energy content. Since the majority of insulin-dependent diabetic persons are thin when first diagnosed, a diet adequate in energy for normal growth and development in children and for attainment of a desirable body weight in adults should be a major goal. Special attention should be given to the nutritional needs of the pregnant diabetic woman in order to insure normal growth and development of the fetus.

Standardization of total daily energy intake for each meal should be emphasized to the patient and reinforced with each visit to the diet counselor. If the patient is taking two to three injections of short-acting insulin daily, or using

short-acting insulin as a supplement to the longer-acting insulins, greater flexibility in meals may be allowed by adjustment of insulin dosage. However, this decision must be made by the patient's physician. Variations in exercise patterns that require adjustments in food intake also should be brought to the attention of the physician and should be thoroughly explained to the patient.

SPECIAL DIETARY CONSIDERATIONS IN OBESE, NON-INSULIN-DEPENDENT DIABETIC PERSONS

In epidemiologic studies, obesity is almost invariably associated with the expression of diabetes in a variety of populations. It has long been known that weight reduction in obese persons reduces hyperglycemia, hyperlipidemia, and elevated blood pressure, factors associated with an increased risk for atherosclerosis. Therefore, the single most important objective in dietary management of the obese, non-insulin-dependent diabetic person is to achieve and maintain a desirable body weight. This can be accomplished only by a reduction in total energy intake to levels below energy expenditure. With weight loss and successful maintenance of that weight loss, glucose tolerance in many patients returns to or toward normal, and they no longer need to be treated with insulin or oral glucose-lowering agents. This often occurs even before achievement of desirable weight and is frequently an encouragement to the patient. A supervised weight reduction program with ongoing support by health-care professionals functioning as a team is of primary importance. However, the results of attempted weight control in this manner are not necessarily better in the diabetic than in the nondiabetic obese population. Therefore, the pragmatic physician will not delay introducing other modalities of treatment, if deemed necessary.

Diet composition. The macronutrient composition of the diet of the non-insulin-dependent obese diabetic person is less important than in the insulin-dependent diabetic person. The diet should provide adequate nutrients. For weight reduction, the diet should be nutritionally adequate for that individual, but calories should be restricted. During a severe weight reduction regimen, vitamin and mineral supplements may be required. Such supplements may be appropriate for adults consuming fewer than 1000–1200 calories per day. Diets below 1500 calories should be carefully evaluated for nutritional adequacy.

Regularity of meals. In the obese, non-insulin-dependent diabetic person treated with insulin or oral glucose-lowering agents, regularity of meals and the relationship of meals to physical activity may be important, just as it is in the ketosis-prone diabetic individual. In the obese diabetic person not receiving insulin or oral glucose-lowering agents, this requirement is less important than decreased caloric but otherwise nutritionally adequate intake.

INDIVIDUALIZATION OF THE MEAL PLAN

The above recommendations are generalizations that are applicable to most persons with diabetes. However, individualization of treatment in relationship to the ethnic background, previous dietary habits, and specific metabolic abnormalities and complications associated with the diabetic state of each patient must be emphasized. An appropriate dietary recommendation also presupposes prior diagnostic evaluation by a physician for conditions that may influence diet.

SUMMARY

The need for essential basic nutrients is the same for all persons of equivalent age, sex, and size, whether diabetic or not. For persons with diabetes treated with insulin or glucose-lowering agents, special precautions regarding kinds, amounts, distribution, and timing of food intake are required. In general, some liberalization in carbohydrate intake is recommended, preferably as complex carbohydrate (starch associated with fiber) and as a replacement for some of the fat. This does not imply that unlimited ingestion of carbohydrate, particularly as sugars, is advocated. A regimen of insulin, diet, and exercise should be designed that takes into consideration, when feasible, the food preferences and eating habits of that individual.

Therapy for the obese non-insulin-dependent diabetic person is based primarily on weight control. Although compliance with such regimens may be difficult, special attention on the part of health-care professionals working as a team can yield encouraging results.

It is recognized that the field of nutrition is a dynamic science. As new facts emerge and concepts change, the nu-

tritional recommendations for diabetic and nondiabetic persons will continue to undergo evolution and modification. However, with the information now available, it is possible to make the diet for individuals with diabetes more flexible and compatible with the usual American life-style. It is hoped it will also lead to improved health and life expectancy.

This report, prepared by Frank Q. Nuttall, M.D., Ph.D., and John D. Brunzell, M.D., has been reviewed and approved by the American Diabetes Association's Committee on Food and Nutrition.

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