

# The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern

Mohammad Asif

Department of Pharmacy, GRD Institute of Management and Technology, Dehradun, (Uttarakhand), India

## ABSTRACT

Type-2 diabetes is a major, non-communicable disease with increasing prevalence at a global level. Type-2 diabetes results when the body does not make enough insulin or the body cannot use the insulin it produces. Type-2 diabetes is the leading cause of premature deaths. Improperly managed, it can lead to a number of health issues, including heart diseases, stroke, kidney disease, blindness, nerve damage, leg and foot amputations, and death. Type-2 diabetes or adult-onset diabetes is most common type of diabetes, usually begins when a person is in his or her mid-50s, but diabetes is not inevitable. Minor changes in your lifestyle can greatly reduce your chances of getting this disease. Therefore, in order to prevent this condition, action should be taken regarding the modifiable factors that influence its development-lifestyle and dietary habits. However, with proper testing, treatment and lifestyle changes, healthy eating as a strategy, promote walking, exercise, and other physical activities have beneficial effects on human health and prevention or treatment of diabetes, promoting adherence to this pattern is of considerable public health importance.

**Key words:** Diet, lifestyle, non-communicable disease, public health, type-2 diabetes

## INTRODUCTION

Diabetes mellitus or type-2 diabetes, is one of the major non-communicable and fastest growing public health problems in the world, is a condition difficult to treat and expensive to manage. It has been estimated that the number of diabetes sufferers in the world will double from the current value of about 190 million to 325 million during the next 25 years.<sup>[1-3]</sup> Individuals with type-2 diabetes are at a high risk of developing a range of debilitating complications

such as cardiovascular disease, peripheral vascular disease, nephropathy, changes to the retina and blindness that can lead to disability and premature death. It also imposes important medical and economic burdens. Genetic susceptibility and environmental influences seem to be the most important factors responsible for the development of this condition. However, a drastic increase of physical inactivity, obesity, and type-2 diabetes has been recently observed. The fact indicates that obesity and physical inactivity may constitute the main reasons for the increasing burden of diabetes in the developed world.<sup>[4-10]</sup>

**Address for correspondence:** Mr. Mohammad Asif,  
Department of Pharmacy, GRD Institute of Management and Technology,  
Dehradun, (Uttarakhand) - 248 009, India.  
E-mail: [aasif321@gmail.com](mailto:aasif321@gmail.com)

Fortunately, because environmental factors are modifiable, disease manifestation from these factors is largely preventable. Diet is one of the major factors now linked to a wide range of diseases including diabetes. The amount and type of food consumed is a fundamental determinant of human health. Diet constitutes a crucial aspect of the overall management of diabetes, which may involve diet alone, diet with oral hypoglycemic drugs, or diet with insulin.<sup>[11-15]</sup> Diet is individualized depending on age, weight, gender, health condition, and occupation etc. The dietary guidelines as used in this review are sets of advisory statements that give quick dietary advice for the management of the diabetic population

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in order to promote overall nutritional well-being, glycogenic control, and prevent or ameliorate diabetes-related complications.

### Objectives of dietary treatment of diabetes

The aims of dietary treatment of diabetes are:

- To achieve optimal blood glucose concentrations.
- To achieve optimal blood lipid concentrations.
- To provide appropriate energy for reasonable weight, normal growth, and development, including during pregnancy and lactation.
- To prevent, delay, and treat diabetes-related complications.
- To improve health through balanced nutrition.

The attempts to adhere to the conventional food measurements in order to comply with prescriptions of the so-called 'diabetic diet' usually result in unnecessary restrictions, overindulgence, or monotonous consumption of certain food items, e.g., unripe plantain/beans. This is a consequence of illiteracy, poverty, and cultural misconceptions about the role of diet in the management of diabetes. This is usually the most problematic aspect of diabetes care. The usually recommended daily energy intake for the non-obese diabetic patient is between 1500 and 2500 calories per day, the average allowance being 2000 k calories per day. The recommendation for the overweight diabetic patient is between 800 and 1500 k calories per day, while the underweight (including growing children and adolescents) should be allowed at least 2500 k calories/day.<sup>[16,17]</sup>

## DIET AND DIABETES

The beneficial effect of the dietary pattern on diabetes mellitus and glucose metabolism in general and traditional food pattern was associated with a significant reduction in the risk of developing type-2 diabetes. The dietary pattern emphasizes a consumption of fat primarily from foods high in unsaturated fatty acids, and encourages daily consumption of fruits, vegetables, low fat dairy products and whole grains, low consumption of fish, poultry, tree nuts, legumes, very less consumption of red meat.<sup>[18-20]</sup> The composition of diet is one of the best known dietary patterns for its beneficial effects on human health that may act beneficially against the development of type-2 diabetes, including reduced oxidative stress and insulin resistance. High consumption of vegetables, fruits, legumes, nuts, fish, cereals and oil leads to a high ratio of monounsaturated fatty acids to saturated fatty acids, a low intake of trans fatty acids, and high ingestion of dietary fiber, antioxidants, polyphenols. The diets are characterized by a low degree of energy density overall; such diet prevent weight gain and exert a protective effect on the development of type-2 diabetes, a condition that is partially mediated through weight maintenance. Greater adherence to the diet in combination with light physical activity was associated with lower odds of having diabetes after adjustment for various factors.<sup>[21-25]</sup> On the other hand, a paleolithic diet (i.e., a diet consisting of lean meat, fish, shellfish, fruits and vegetables,

roots, eggs and nuts, but not grains, dairy products, salt or refined fats, and sugar) was associated with marked improvement of glucose tolerance while control subjects who were advised to follow a diet did not significantly improve their glucose tolerance despite decreases in weight and waist circumference.<sup>[26-28]</sup> People most likely to get diabetes are: People who are overweight, upper-body obesity, have a family history of diabetes, age 40 or older, and women (50% more often than men).

## TREATMENTS OF DIABETES

Each person needs individualized treatment. Type-1 diabetes always requires insulin, diet, and exercise. Type-2 diabetics require insulin or oral hypoglycemic agents (medication that helps lower blood sugar), if diet and exercise alone fail to lower blood glucose. If you have diabetes, you need to have a medical team (doctor, nutritionist, and health educator or nurse) working with you. Whichever type of diabetes you have, the key to proper control is balancing the glucose and the insulin in the blood. This means adjusting your diet, activity, and sometimes taking medication.<sup>[29,30]</sup>

## GENERAL DIETARY GUIDELINES

Modern dietary management of diabetes essentially involves modifications of the quality and quantity of food to be taken by the diabetic patient. The following guidelines are applicable to diabetes irrespective of type, weight status, age, gender, or occupation.<sup>[31-40]</sup>

- Most of the carbohydrate consumed should be in the form of starch (polysaccharides) such as maize, rice, beans, bread, potatoes etc.
- All refined sugars such as glucose, sucrose, and their products (soft drinks, sweets, toffees, etc.) and honey should be avoided, except during severe illness or episodes of hypoglycemia. These foods contain simple sugar, which is easily absorbed causing rapid rise in blood sugar.
- Non-nutritive sweeteners, e.g., Canderel, saccharine, NutraSweet, aspartame are suitable sugar substitutes for diabetic subjects.
- Animal fat such as butter, lard, egg yolk, and other foods high in saturated fatty acids and cholesterol should be reduced to a minimum and be replaced with vegetable oils, particularly polyunsaturated fats.
- Salt should be reduced whether hypertensive or not.
- Protein (fish, meat, beans, crab, crayfish, soyabean, chicken, etc.) and salt are restricted for those with diabetic nephropathy.
- Cigarette smoking should be avoided by diabetic patients. Alcohol should be taken only in moderation.
- The items allowed for free consumption include: Water, green leafy vegetables, tomatoes, onions, cucumber, aubergine, peppers, vegetable salad without cream. Any brand of tea, coffee, or drinks that contain very low or no calories.
- For patients too ill to eat solid food, a fluid or semi-solid

diet should be substituted (papaya, soya bean, custard, etc.).

- Patients treated with insulin or certain oral hypoglycemic agents, e.g., sulfonylureas must be advised to eat regularly and often to prevent hypoglycemia- 3 meals a day plus suitable snacks in between, e.g., fresh fruits.
- Small meals spaced over the day, rather than 1 or 2 big meals, are helpful in avoiding post-prandial peaks in blood sugar.

When overweight diabetic patients drop some weight by trimming down 'serving sizes' and calories, insulin sensitivity improves, thereby optimizing drug therapy. The fundamental principle behind maintenance of body weight is the energy balance. This group should be encouraged to maintain their current weight by: Maintaining current 'serving sizes,' eating about the same amount of food each day, eating at about the same times each day, taking their drugs at the same times each day, and exercising at the same times each day. These patients should also endeavor to choose their daily foods from starches, vegetables, fruits, and protein, while limiting the amount of fats.<sup>[41-45]</sup>

### Dietary approaches to diabetes

Food can be powerful in preventing and reversing diabetes. However, dietary approaches have changed as we have learned more about the disease. The traditional approach to diabetes focuses on limiting refined sugars and foods that release sugars during digestion-starches, breads, fruits, etc. With carbohydrates reduced, the diet may contain an unhealthy amount of fat and protein. Therefore, diabetes experts have taken care to limit fats- especially saturated fats that can raise cholesterol levels, and to limit protein for people with impaired kidney function. The new approach focuses more attention on fat. Fat is a problem for people with diabetes. The more fat there is in the diet, the harder time insulin has in getting glucose into the cells. Conversely, minimizing fat intake and reducing body fat help insulin do its job much better. Newer treatment programs drastically reduce meats, high-fat dairy products, and oils.<sup>[46-50]</sup> At the same time, they increase grains, legumes, fruits, and vegetables. The study found that patients on oral medications and patients on insulin were able to get off of their medications after some days on a near-vegetarian diet and exercise program. During 2 and 3-year follow-ups, most people with diabetes treated with this regimen have retained their gains. The dietary changes are simple, but profound, and they work.<sup>[51-53]</sup>

## EFFECTS OF THE FRUIT AND VEGETABLES ON THE HUMAN HEALTH

Fruits constitute a commercially important and nutritionally indispensable food commodity. Being a part of a balanced diet, fruits play a vital role in human nutrition by supplying the necessary growth regulating factors essential for maintaining normal health. They have been especially valuable for their ability to prevent vitamin C and vitamin A deficiencies. Fruits and vegetables are good source

of vitamins, minerals, flavonoids (anti-oxidants), saponins, polyphenols, carotenoids (vitamin A-like compounds), isothiocyanates (sulfur-containing compounds), and several types of dietary fibers. The fruits and vegetables not only prevent malnutrition but also help in maintaining optimum health through a host of chemical components that are still being identified, tested, and measured. They prevent various chronic diseases like stroke, hypertension, birth defects, cataracts, diabetes, heart disease, cancers, diverticulosis, obstructive pulmonary disease (asthma and bronchitis), and obesity etc.<sup>[53-56]</sup> Diets that are high in insoluble fiber may offer the best protection against this disease. Fruits and vegetables are high in cellulose-a type of insoluble fiber. Diets that are high in fiber may be able to help in the management of diabetes. Soluble fiber delays glucose absorption from the small intestine and thus may help prevent the spike in blood glucose levels that follow a meal or snack. The long-term effect may be insignificant, however, due to the many other factors that affect blood glucose. The effects of the fruit and vegetables on the human health allowed to once again measuring the enormous stakes.<sup>[57-60]</sup> More and more emphasis is put on the importance of the diversity of food, and in particular of the fruit and vegetables. This new and effective approach to diabetes is remarkably simple. Here are 4 simple steps to managing your blood sugar (and weight, blood pressure, and cholesterol) with diet.<sup>[61-70]</sup>

### Begin a vegan diet: Avoid animal products

Animal products contain fat, especially saturated fat, which is linked to heart disease, insulin resistance, and certain forms of cancer. These products also contain cholesterol and, of course, animal protein. It may surprise you to learn that diets high in animal protein can aggravate kidney problems and calcium losses. Animal products never provide fiber or healthful carbohydrates. A *vegan* diet is one that contains no animal products at all. Therefore, you'll have to avoid red meat, poultry, fish, dairy products, and eggs.

### Go high fiber

Aim for 40 grams of fiber a day, but start slowly. Load up on beans, vegetables, and fruits. Choose whole grains (barley, oats, millet, whole-wheat, etc.). Aim for at least 3 grams per serving on food labels and at least 10 grams per meal.

### Low-fat, vegetarian diets are ideal for people with diabetes

The health benefits of a low-fat vegetarian diet such as portions of vegetables, grains, fruits, and legumes (excluding animal products) in people with type-2 diabetes. The vegan diet is based on American Diabetes Association (ADA) guidelines; the results of this study were astounding: Forty-three percent of the vegan group reduced their diabetes medications. Among those participants who didn't change their lipid-lowering medications, the vegan group also had more substantial decreases in their total and LDL cholesterol levels.

### Avoid added vegetable oils and other high-fat foods (avoid)

Although most vegetable oils are in some ways healthier than animal fats, you will still want to keep them to a minimum. All fats and oils are highly concentrated in calories. A gram of any fat or oil contains 9 calories, compared with only 4 calories for a gram of carbohydrate. Avoid foods fried in oil, oily toppings, and olives, avocados, and peanut butter. Aim for no more than 2-3 grams of fat per serving of food, e.g., white or wheat bread, most cold cereals, watermelon, pineapple, baking potatoes, sugar.

### Favor foods with a low glycemic index (enjoy)

The glycemic index identifies foods that increase blood sugar rapidly. This handy tool allows you to favor foods that have much less effect on blood sugar. High-glycemic-index foods include sugar itself, white potatoes, most wheat flour products, and most cold cereals, e.g., pumpernickel, rye, multigrain, or sourdough bread, old-fashioned oatmeal, bran cereals, grape-nuts, most fruits, sweet potatoes, pasta, rice, barley, couscous, beans, peas, lentils, most vegetables [Table 1].

### Food groups

Choose unlimited amounts of grains, legumes, fruits, and vegetables. Modest amounts of non-fat condiments, alcohol, and coffee are also fine.

### Reduce salt (“sodium”) in diet

High blood pressure may also be present with your diabetes. Limiting how much salt you eat can help keep your blood pressure low. Decrease the amount of salt you add during cooking and reduce salt in recipes, before adding salt at the table, taste first, try seasoning your food with (salt-free) herbs, spices, and garlic. Lemon juice brings out the natural saltiness of foods. Avoid processed foods that are high in salt (sodium chloride) such as canned or packaged foods and condiments such as mustard, watch for “Na” (sodium) on food labels. Chips, pretzels, and other such snacks are

very high in salt, and check with your physician before using salt substitutes.

### Alcohol

- Limit alcohol to less than 2 drinks per day (1 drink = 12 oz beer = 1.5 oz liquor = 4 oz wine)
- Drinking alcohol is not recommended if you: Have high triglycerides (blood fats), have high blood pressure, have liver problems, are pregnant or breastfeeding.
- If you choose to drink alcohol, remember: To drink with your meal or snack (not on an empty stomach!), to drink slowly or dilute with water or diet soda, that liqueurs, sweet wines and dessert wines have a lot of sugar, to wear your Medic Alert (Alcohol can cause hypoglycemia/low blood glucose), reducing alcohol can promote weight loss and help you lower your blood pressure.

### Caffeine

Drink no more than four (4) cups of coffee or caffeine-containing beverages per day.

### Food preparation

Avoid adding sugar during cooking. use Splenda (sucralose) instead of sugar if baking or cooking, use low-fat and low sugar sauces and marinades, use reduced-fat cooking methods such as barbecuing, broiling, roasting, and steaming and avoid frying and deep-fat frying.

## FOODS TO ALWAYS CHOOSE

### Whole grain products

Whole and multi grain breads, whole wheat pasta, brown rice, low-fat and multigrain crackers, low-sugar, whole-grain cereals, oatmeal, bran, bulgur, buckwheat, low-fat, whole grain baked goods with added bran or oat bran [Table 2].

Table 1: Classification of foods on basis of Glycemic index		
Glycemic index		
Low-GI (enjoy) or foods <i>choose most often</i>	Medium GI foods <i>choose occasionally</i>	High-GI (avoid) or high GI foods <i>choose less often</i>
Whole grain breads, oatmeal (slow cook oats), all-bran cereal, converted or parboiled rice, brown rice, pumpernickel bread, pasta, all beans, peas and lentils, apple, orange, tomato juice, sweet potato, carrots, broccoli, cauliflower, apples, peaches, pears, grapefruits, oranges, sweet corn, dark leafy vegetables, popcorn, marmalade, jams-small amount, skim or 1% milk, low fat, yogurt, soy beverage	Couscous, basmati rice, shredded wheat cereal, pita bread, rye bread, high fiber crackers baked snack foods (not fried), white bread, whole wheat pretzels, cantaloupe, pineapple	Instant mashed potatoes, baked white potatoes, red potatoes, parsnips, rutabaga, instant rice, corn flakes, rice krispies, refined cereals, bagels, waffles/pancakes, pretzels, soda crackers, rice crackers, French fries, digestive cookies, graham crackers, dried dates, figs, fruit bars, sports drinks, sweetened soft drinks, glucose

Table 2: List of foods to always choose			
Vegetables	Fruits	Grains	Legumes
All, except white potatoes. Examples include tomatoes, cucumbers, carrots, broccoli, cauliflower, spinach, kale, collards, squash, green beans, sweet potatoes, and artichokes	All, except avocados, olives, pineapple, and watermelon. bananas, apples, grapes, pears, peaches, oranges, melons, grapefruit, kiwi, and berries, among others, are all good choices	Pasta, rice, high-fiber cereals, corn, oatmeal, couscous, bulgur wheat, millet, barley, rye, etc	Beans (black, pinto, kidney, garbanzo, white, etc.), peas, split peas, lentils, non-fat soy products



### Vegetables and fruits

Eat green leafy vegetables; eat an abundance fresh/frozen vegetables and unsweetened, fresh, frozen, or canned fruits

### Milk/Dairy products

Dairy products with less than 1% fat and cheese should be 10-20% ME.

### Meat and alternatives

Fish (canned in water, fresh, frozen), seafood, skinless chicken and turkey, lean meats with fat trimmed, wild game, lean cold cuts (but watch the salt content), legumes, tofu, eggs (up to 8 per week).

### Other foods and fats

Olive, canola, soybean, sesame, sunflower oils (3 tsp or less per day), non-hydrogenated soft margarines, low-calorie dressings and mayonnaise, light peanut butter, nuts (watch salt and calories), unsalted seeds: Flax, pumpkin, sunflower, defatted gravy and low-sugar condiments, cocoa powder or a small piece of dark chocolate.

### Sweets (in very small amounts)

Sugar substitutes and artificial sweeteners, low sugar jams/jellies/syrups, sugar-free candies, gelatins, gum, low-sugar and high fiber baked goods, and low-fat and low-sugar frozen dessert

### Snack foods

Popcorn without salt, butter, or hydrogenated oils and choose low fat, low sugar snack foods.

## ROLE OF PHYSICAL ACTIVITY OR EXERCISE

Regular physical activity helps the body cells take up glucose and thus lower blood glucose levels. Regular physical activity also helps with weight loss as well as controlling blood cholesterol and blood pressure. You need to let your doctor and dietitian know about the kinds of physical activities you do regularly. Your doctor and dietitian will help you balance your physical activity with your medication and diabetic meal plan. If you are not physically active now, your doctor may recommend that you increase physical activity. Important benefits of a regular aerobic exercise program in diabetes management include decreased need for insulin, decreased risk of obesity, and decreased risk for heart disease. Exercise decreases total cholesterol, improves the ratio of low-density lipoprotein (LDL) to high-density lipoprotein cholesterol (HDL), and reduces blood triglycerides. It may also decrease blood pressure and lower stress levels. Walking is one of the easiest and healthiest ways to exercise. This is one activity that anyone can do for a lifetime without special equipment and with little risk of injury. Talk to your doctor about exercise. Supervised activity is best because of the risk of an insulin imbalance. Use the buddy system when you exercise.<sup>[71-77]</sup>

### Reducing weight

Eat smaller portions of foods and remember that your lunch and dinner plate should be 1/4 protein, 1/4 starch (including

### List of foods/drinks to be avoided and their alternatives

Sugary foods/drinks to avoid	Suitable alternatives
Sugar, sucrose, glucose, fructose, dextrose glucose syrup. 'diabetic' sweeteners with sorbitol or other polyols. Sweeteners with some sugars added e.g., hermesetas sprinkle sweet, boots sugarlite, sucron	Artificial sweeteners made with aspartame, saccharin or acesulfame K Tablets, liquid, powder or granulated e.g., canderel, flix, hermesetas, natrena, sweetex
Ordinary fizzy drinks, squashes and cordials e.g., cola, lemonade, lucozade, barley water Sweetened fruit juices	Diet, slimline or one calorie fizzy drinks Sugar free/No added sugar squash. Only a small glass of pure fruit juice with a meal
All sweet biscuits e.g., with syrup, sucrose, chocolate, cream etc.	Plain biscuit e.g., digestive, Hob Nobs, hovis, marie, rich tea, morning coffee, garibaldi, savory crackers, or oatcakes, occasionally
Cakes and sweet pastries	Only occasionally, especially if you are overweight: Whole meal scone, teacake, bara brith, malt loaf or teabread, crumpet or muffin. Home-made low sugar wholemeal cake
Chocolates, sweets, mints, toffees including 'Diabetic' chocolates etc.	Sugar-free mints or chewing gum. Opt for fresh fruit, crispbread or crackers instead
Ordinary and 'Diabetic' jam/marmalade	A little pure fruit, reduced sugar jam, or marmalade
Honey, syrup, treacle, lemon curd	Try savory spreads e.g., a little peanut butter, marmite, or low fat cheese spread on toast or crackers

potatoes), and 1/2 vegetables. Eat 3 balanced meals per day (no more than 6 hours apart), and don't skip meals; snack with fruit between meals. Choose foods lower in fat and sugar; choose low GI index foods whenever possible; avoid "white" foods (white flour and white sugar).

### Glucose testing

Your diabetic meal plan, physical activity, and medication are all balanced to help keep your blood glucose levels normal. You need to check your blood glucose levels at home to keep track of how you are doing. Soon you will learn how the foods you eat and your physical activity affect your blood glucose level. The best defense against diabetic complications is to keep blood glucose in control and take good care of yourself. Keeping your blood glucose in control will help you feel better now and stay healthy in the future.<sup>[78-80]</sup>

## DISCUSSION

The breakfast should be 1/3 fruit, 1/3 starchy fiber foods (multigrain bread and cereal products), and 1/3 protein (nuts, eggs, tofu, beans, lentils, low-fat dairy products). The lunch and dinner plates should be 1/2 vegetables, 1/4 starchy fiber foods, and 1/4 protein. Choose whole grains, such as whole wheat

pasta, whole wheat bread, and brown rice to increase fiber intake. Most of these are low in fat. Choose only lean meat and poultry.<sup>[81-84]</sup> Remove skin and trim fat before cooking (50-100 g or 2-4 oz). See the milk fat (MF) of all dairy products. Use skim or 1% milk products and low-fat cheese (less than 20% MF), or choose fortified soy products. Reduce your total fat intake (less than 25% - 35% of your daily calories). To achieve this, always try to choose low fat foods and avoid fried foods. Limit saturated and trans fats to less than 10% of your daily calories. Try to always choose unsaturated fats such as olive and canola oils and non-hydrogenated margarine (in moderation). Saturated and trans fats raise blood cholesterol levels, while unsaturated fats lower blood cholesterol. Saturated fats are solid at room temperature and are usually of animal origin. They are found in meats, whole milk, dairy products, butter, and hard margarines.<sup>[85-90]</sup> Trans fats are found in baked and pre-packaged foods. Hydrogenation is a process that changes liquid vegetable oil into a solid fat such as hard margarine. The hydrogenation process changes some of the good fats into cholesterol-raising saturated and trans fats. People with diabetes are at a greater risk of developing or have already high levels of fats in their heart and blood vessels. Omega-3 fatty acids are found in cold water fish such as herring, mackerel, salmon, trout, sardines and tuna, and in flaxseeds (2 tbsp per day, freshly ground).<sup>[90-93]</sup> Three to four servings of fish per week is recommended as part of a healthy, balanced diet. Omega-enriched foods are also available in supermarkets such as omega-3 eggs and omega-3 enriched dairy products. Omega-3 supplements: Always look for the active ingredients DHA and EPA. Recommendations are 600-900 mg/day. Always check with your doctor or registered dietitian before taking any supplements. Increase fiber in your diet by eating more whole grain foods, vegetables, fruits, and legumes.<sup>[94-96]</sup> These foods also contain vitamins, minerals, and antioxidants and have a lower glycemic index. Low glycemic index foods will help to keep your blood sugar levels in the target range.<sup>[97-99]</sup>

## CONCLUSION

In conclusion, effective lifestyle modifications including counseling on weight loss, adoption of a healthy dietary pattern like the Mediterranean diet, together with physical activity are the cornerstone in the prevention of type-2 diabetes. Therefore, emphasis must be given to promoting a healthier lifestyle and finding solutions in order to increase adherence and compliance to the lifestyle modifications, especially for high-risk individuals. Results from epidemiological studies and clinical trials evaluating the role of the Mediterranean dietary pattern regarding the development and treatment of type-2 diabetes indicate the protective role of this pattern. As a result, promoting adherence to the Mediterranean diet is of considerable public health importance as this dietary pattern, apart from its various health benefits, is tasty and easy to follow in the long-term. Diet is an important aspect in the management of a diabetic patient. The diabetic healthcare provider and the patient should understand the basic dietary needs of the patient. In this form, there may be plenty of insulin in the bloodstream, but the cells are resistant to it. Glucose cannot easily get into the cells, and it backs up in

the bloodstream. Over the short run, people with uncontrolled diabetes may experience fatigue, thirst, frequent urination, and blurred vision. In the long run, they are at risk for heart disease, kidney problems, disorders of vision, nerve damage, and other difficulties.

*There is no cure for diabetes. However, you can manage or delay diabetes through diet, exercise, weight control and, if necessary, medication.*

*-Jacquelyn W. McClelland*

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