NUTRITION AND DIABETES MELLITUS

Dr. Aftab Nazir

Abstract: Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Type 1 diabetes most often results from a cellular mediated autoimmune destruction of the beta cells of the pancreas. Individuals with type 2 diabetes have insulin resistance and relative insulin deficiency. Medical nutrition therapy (MNT) is an integral component of diabetes management. A healthy diet is a diet that provides the nutrients your body needs in sufficient amounts. As for the general population, people with diabetes are encouraged to choose a variety of fiber-containing foods, such as whole grains, fruits, and vegetables, because they provide vitamins, minerals, fiber, and other substances important for good health. The primary dietary fat goal in persons with diabetes is to limit saturated fat and dietary cholesterol intake.

Key words: Diabetes Mellitus, Medical Nutrition therapy, Fiber, Fat, Cholesterol.

Diabetes Mellitus

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

Classification of Diabetes Mellitus

Type 1

Type 1 diabetes most often results from a cellular mediated autoimmune destruction of the beta cells of the pancreas. Patients with this form of diabetes are dependent upon insulin for survival and are at risk for ketoacidosis. Type 1 diabetes commonly presents in childhood and adolescence but may present at any age.

Type 2

Individuals with type 2 diabetes have insulin resistance and relative insulin deficiency. Over time, the potential for absolute deficiency exists. Primary treatment centers on beta cell preservation and improving insulin resistance via weight loss, improved nutrition, and increased age-appropriate physical activity. Type 2 diabetes commonly goes undiagnosed for years because it is often asymptomatic in its early stages. Individuals with undiagnosed type 2 diabetes are at increased risk for developing macro- and microvascular complications.

Gestational Diabetes Mellitus (GDM)

GDM, which typically occurs following the 24th week of pregnancy, is defined as any degree of glucose intolerance with onset or

Article Citation: Nazir A, Nutrition and Diabetes Mellitus. Indep Rev Jan-Jun 2018;20(1-6): 54-60.

Date received: 09/10/2017
Date Accepted: 10/12/2017

Correspondence Address:
Dr. Aftab Nazir
Lecturer Community Medicine
Independent Medical College Faisalabad

1. Dr. Aftab Nazir
Lecturer Community Medicine
Independent Medical College Faisalabad.

first recognition during pregnancy. It does not exclude the possibility that unrecognized glucose intolerance may have preceded, or begun concomitantly with the pregnancy. Six weeks or more after the pregnancy ends, a woman with GDM should be tested to rule out type 1 or type 2 diabetes or pre-diabetes. Women with GDM and their children have a higher risk for development of type 2 diabetes later in life.

Pre-diabetes

Both Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT) have been categorized as pre-diabetes and are risk factors for future diabetes and cardiovascular disease. IFG has been defined as a fasting plasma glucose of > 100 mg/dl but < 126 mg/dl. IGT is defined as a 2-hour oral glucose tolerance test value (OGTT) of > 140 mg/dl, but < 200 mg/dl.

Nutrition and Diabetes

A healthy and balanced diet is very important for everybody, but even more so for diabetics. Adequate changes in diet help to control blood sugar levels. Historically, nutrition principles and recommendations for diabetes and related complications have been based on scientific evidence and diabetes knowledge when available and, when evidence was not available, on clinical experience and expert consensus. The goal of evidence-based recommendations is to improve the quality of clinical judgments and facilitate cost-effective care by increasing the awareness of clinicians and patients with diabetes of the evidence supporting nutrition services and the strength of that evidence, both in quality and quantity.

Medical nutrition therapy (MNT) is an integral component of diabetes management. You can control your blood sugar successfully if you:

- Maintain an optimal weight
- Pay attention to what you eat
- Consider how much you eat

Goals of Medical Nutrition Therapy for Diabetes:

Numerous advances in diabetes management and medical nutrition therapy (MNT) for individuals with diabetes has been achieved. Goals of MNT that apply to all persons with diabetes are as follows:

1. To attain and maintain optimal metabolic outcomes, including:
    a. blood glucose levels in the normal range or as close to normal as is safely possible to prevent or reduce the risk for complications of diabetes.
    b. a lipid and lipoprotein profile that reduces the risk for macro vascular disease.
    c. blood pressure levels that reduce the risk for vascular disease.
2. To prevent and treat the chronic complications of diabetes; modify nutrient intake and lifestyle as appropriate for prevention and treatment of obesity, dyslipidemia, cardiovascular disease, hypertension, and nephropathy.
3. To improve health through healthy food choices and physical activity
4. To address individual nutritional needs, taking into consideration personal and cultural preferences and lifestyle while respecting the individual's wishes and willingness to change

The goals of MNT that apply to specific situations include the following:

1. For youth with type 1 diabetes, to provide adequate energy to ensure normal growth and development, and to integrate insulin

regimens into usual eating and physical activity habits.
2. For youth with type 2 diabetes, to facilitate changes in eating and physical activity habits that reduce insulin resistance and improve metabolic status.
3. For pregnant or lactating women, to provide adequate energy and nutrients needed for optimal outcomes.
4. For older adults, to provide for the nutritional and psychosocial needs of an aging individual.
5. For individuals being treated with insulin or insulin secretagogues, to provide self-management education for treatment (and prevention) of hypoglycemia, acute illnesses, and exercise-related blood glucose problems.
6. For individuals at risk for diabetes, to decrease the risk by encouraging physical activity and promoting food choices that facilitate moderate weight loss or at least prevent weight gain.

Diet Plan

The diet may be used alone or in combination with insulin injections or oral hypoglycaemic drugs.

The diet plan of an individual is based on height, weight, age, sex, physical activity and nature of diabetes. One should consider the following points while planning a diabetic diet:

- Determining energy requirements
- Determining the type of carbohydrates, fiber and food preparations
- Presence of any other complication such as high blood pressure, high cholesterol levels etc.

In case of insulin dependent diabetes mellitus, the energy intake is based on needs for normal growth and development, physical activity and maintenance of desirable body weight.

In case of non-insulindependent diabetes mellitus, the majority of patients are overweight or obese. Therefore, calorie restriction is required to achieve a desired weight.

A Healthy Diet

A healthy diet is a diet that provides the nutrients your body needs in sufficient amounts. Different people need different amounts of calories.

Here are six general guidelines that apply to all people and more importantly, to diabetics:

- Eat variety of foods. No single category of food can give you all the nutrients you need. A healthy diet always includes food from each of the different food groups.
- Eat the amount of food your body needs. When you eat more food than your body needs, the extra calories are stored as fat. Find your ideal weight and activity level and strive to reach and keep that weight.
- Eat a lot of grain products, vegetables and fruits. Dietitians recommend plant foods because they include few calories and a lot of fiber, vitamins and minerals. In addition, they have no cholesterol and are low in fat.
- Eat a diet low in fat and cholesterol. Less than 30% of the calories eaten by diabetics should come from fat.
- Consume certain foods and drinks in moderation. Carbohydrates, specifically candy, desserts, sweetened drinks, salt, and alcohol, should be consumed in moderation.
- Refrain from smoking.

Type of carbohydrate

When referring to common food carbohydrates, the following terms are preferred: sugars, starch, and fiber. Terms such as simple sugars, complex carbohydrates, and fast-acting carbohydrates are not well defined and should be avoided.

Studies in healthy subjects and those at risk for type 2 diabetes support the importance of including foods containing carbohydrate, particularly from whole grains, fruits, vegetables, and low-fat milk in the diet of people with diabetes.

More of carbohydrate must be given as complex starches rather than simple sugars as they breakdown more slowly to release glucose in blood. The presence of fiber in complex carbohydrate like grains, vegetables and other starches slows the glucose absorption. One should emphasize more on the high fiber foods instead of high fiber supplements available in the market.
Glycemic index.

Although low glycemic index diets may reduce postprandial glycemia, the ability of individuals to maintain these diets long-term (and therefore achieve glycemic benefit) has not been established. The available studies in persons with type 1 diabetes in which low glycemic index diets were compared with high glycemic index diets (study length from 12 days to 6 weeks) do not provide convincing evidence of benefit. In subjects with type 2 diabetes, studies of 2–12 weeks duration comparing low glycemic index and high glycemic index diets report no consistent improvements in HbA1cor insulin levels.

Fiber

As for the general population, people with diabetes are encouraged to choose a variety of fiber-containing foods, such as whole grains, fruits, and vegetables, because they provide vitamins, minerals, fiber, and other substances important for good health. Early short-term studies using large amounts of fiber in small numbers of subjects with type 1 diabetes suggested a positive effect on glycemia. Recent studies have reported mixed effects on glycemia and lipids. In subjects with type 2 diabetes, it appears that ingestion of very large amounts of fibersare necessary to confer metabolic benefits on glycemic control, hyperinsulinemia, and plasma lipids.

Food groups	High fiber foods	Low fiber foods
Cereals	Whole cereals like whole wheat, dalia, whole wheat flour	Refined cereals like rice, bread, maida, suji, noodles, macaroni, etc
Milk and milk products	-	Milk and milk products
Pulses	Whole dals and dals with husk	Washed dals
Meat, fish and poultry	-	Eggs, chicken, fish
Vegetables	Vegetables like peas, beans, lotus stem etc.	Vegetables like potato, lauki etc.
Fruits	Fruits like apple, cherries, pears, peaches, plums, guava etc.	Fruit juices and fruits like banana and papaya
Fats	-	Fats

Sweeteners

The available evidence from clinical studies demonstrates that dietary sucrose does not increase glycemia more than isocaloric amounts of starch. Thus, intake of sucrose and sucrosecontaining foods by people with diabetes does not need to be restricted because of concern about aggravating hyperglycemia. Sucrose should be substituted for other carbohydrate sources in the food/meal plan or, if added to the food/meal plan, adequately covered with insulin or another glucose-lowering medication.

Protein and Diabetes

In the U.S., protein intake accounts for 15–20% of average energy intake, is fairly consistent across all ages from infancy to older age, and appears to be similar in persons with diabetes. It has been assumed that in people with diabetes, abnormalities of protein metabolism were less affected by insulin deficiency and insulin resistance than glucose metabolism. However, in subjects with type 2 diabetes, it has been demonstrated that moderate hyperglycemia can contribute to an increased turnover of protein, which suggests an increased need for protein. In subjects with type 1 diabetes treated with conventional insulin therapy, short-term kinetic studies have demonstrated increased protein catabolism, suggesting that near-normal glycemia and an adequate protein intake are needed. Because most adults eat at least 50% more protein than required, people with diabetes appear to be protected against protein malnutrition when consuming a usual diet.

A number of studies in healthy subjects and in persons with controlled type 2 diabetes have demonstrated that glucose from ingested protein does not appear in the general circulation, and therefore protein does not increase plasma glucose concentrations. Furthermore, the peak glucose response to carbohydrate alone is similar to that of carbohydrate and protein, suggesting that protein does not slow the absorption of carbohydrate. In subjects with type 1 diabetes, the rate of restoration of euglycemia after hypoglycemia, time to peak glucose levels, and subsequent rate of glucose fall were similar after treatment with either carbohydrate alone or carbohydrate and protein.The effects of protein on regulation of energy intake, satiety, and long-term weight loss have not been adequately studied. The long-term efficacy and safety of high-protein low carbohydrate diets remains unknown.

Dietary Fat and Diabetes

Fatty acids and dietary cholesterol

The primary dietary fat goal in persons with diabetes is to limit saturated fat and dietary cholesterol intake. Saturated fat is the principal dietary determinant of plasma LDL cholesterol. Furthermore, persons with diabetes appear to be more sensitive to dietary cholesterol than the general public.

In non-diabetic persons, low saturated fat and cholesterol diets decrease plasma total cholesterol, LDL cholesterol, and triglycerides with mixed effects on HDL cholesterol. Positive correlations between dietary total and saturated fat and changes in plasma total cholesterol and LDL and HDL cholesterol are observed. Adding exercise results in greater decreases in plasma total and LDL cholesterol and triglycerides and prevents the decrease in HDL cholesterol associated with low-fat diets. However, studies in persons with diabetes demonstrating effects of specific percentages of dietary saturated

fatty acids and specific amounts of dietary cholesterol are not available. Therefore, the goal for persons with diabetes remains the same as for the general population.

In metabolic study diets, in which energy intake and weight are held constant, diets low in saturated fat and high in carbohydrate or enriched with cis-monounsaturated fatty acids (monounsaturated fat) lower plasma LDL cholesterol equivalently. Low–saturated fat high carbohydrate diets increase postprandial levels of plasma glucose, insulin, triglycerides and, in some studies, decrease plasma HDL cholesterol when compared in metabolic studies to isocaloric high monounsaturated fat diets. However, high–monounsaturated fat diets have not been shown to improve fasting plasma glucose or HbA1c values.

When compared with saturated fat, polyunsaturated fats appear to lower plasma total and LDL cholesterol, but not as well as monounsaturated fats. N-3 polyunsaturated fatty acid supplements have been shown to lower plasma triglyceride levels in persons with type 2 diabetes. Although the accompanying rise in plasma LDL cholesterol is of concern, glucose metabolism is not likelyto be adversely affected with their use.

N-3 supplements may be most beneficial in the treatment of severe hypertriglyceridemia. While n-3 fatty acid studies in persons with diabetes have primarily used supplements, there is evidence from the general population that foods containing n-3 fatty acids have cardio-protective effects. Two to three servings of fish per week provide dietary n-3 polyunsaturated fat and can be recommended. Major sources of trans fatty acids in the diet include products made from partially hydrogenated oils such as baked products (including crackers and other snack foods), cookies, doughnuts, breads, and products like fries or chicken fried in hydrogenated shortening. Animal sources, including dairy products, provide smaller amounts of transfatty acids. The effect of transfatty acids is similar to saturated fats in raising plasma LDL cholesterol. In addition, transfatty acids lower plasma HDL cholesterol. Therefore, intake of transfatty acids should be limited. Plant sterol and stanol esters block the intestinal absorption of dietary and biliary cholesterol. Plant sterols/ stanols in amounts of 2 g/day have been shown to lower total and LDL cholesterol.

Fat replacements

Dietary fat intake can be reduced by lowering the amount of high fat foods in the diet or by providing lower-fat or fat-free versions of food and beverages or by using fat replacers (ingredients that mimic the properties of fat but with significantly fewer calories) in food formulations. Regular use of foods with fat replacers may help to reduce dietary fat intake (including saturated fat and cholesterol), but may not reduce total energy intake or weight. Long-term studies are needed to assess the effects of foods containing fat replacers on energy intake and on the macronutrient content of the diets of people with diabetes.

Important to remember

- It is important to control the amount and time of food intake.
- Meals should not be missed.
- Consider the likes and dislikes of the patient.
- Try to substitute the craving for sweet by taking some fruit.

Foods to be avoided

Glucose, sugar, honey, all sweets, chocolates and candies.

Foods to be restricted

Potatoes, arbi, sweet potatoes, mangoes, grapes, bananas, alcoholic beverages, fried foods, paranthas, poories, pakoras, mathris, deep fried foods, dry fruits, salad oils, cakes and pastries.

Foods to be used freely

Green leafy vegetables, tomatoes, cucumber. radish, soups, buttermilk, tea and coffee without sugar.

References

1. American Diabetes Association 2002, 'Standards of medical care for patients with diabetes mellitus', Diabetes Care 25(Suppl. 1): S33–S49.

2. American Diabetes Association 2004, 'Nutrition Principles and Recommendations in Diabetes', Diabetes Care, Volume 27 (Supplement1), S36–S46.

3. American Diabetes Association 2008, 'Nutrition recommendations and interventions for diabetes'Diabetes Care31:S61-S78.

4. American Diabetes Association 2009, 'Diagnosis and classification of diabetes mellitus. Diabetes Care 32 (Supplement 1): S62-S67.

5. Diabetes introduction 2010, Patient education institute. http://www.nlm.nih.gov/medlineplus/tutorials/diabetesintroduction/id029106.pdf

6. Diabetes and meal planning 2011, Patient education institute. http://www.nlm.nih.gov/medlineplus/tutorials/diabetesmealplanning/db059105.pdf

7. Eat right 2012, 'Type 2 Diabetes nutrition therapy', American Dietetic Association http://nutritioncaremanual.org/vault/editor/Docs/Type2DiabetesNutritionTherapy.pdf

8. Franz MJ, Bantle JP, Beebe CA, Brunzell JD, Chiasson JL, Garg A, Holzmeister LA, Hoogwerf B, Mayer-Davis E, Mooradian AD, Purnell JQ, Wheeler M 2002,'Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications'. Diabetes Care25: 148–198.

9. Pastors JG, Warshaw H, Daly A, Franz M, Kulkarni K 2002, 'The evidence for the effectiveness of medical nutrition therapy in diabetes management'. Diabetes Care 25:608–613.