

Everyday Practice : Diabetes Mellitus

Nutrition therapy and exercise

MADHURI PATIL

INTRODUCTION

This article focuses on the role of nutrition therapy and exercise in a person with diabetes. As emphasized in the first article of this series,¹ lifestyle modifications are an integral part of the management of people with diabetes. Initially, most people find it difficult to accept that they have a condition that necessitates lifelong management with their active participation. The main concern of newly diagnosed people with diabetes and their family relates to dietary restrictions—what, when and how.

In India, there are few trained and skilled nutrition and exercise therapists. This means treating physicians are required to provide appropriate advice related to diet and exercise to most people with diabetes. These lifestyle modifications are essential and cannot be supplanted by the large variety of medications available for people with diabetes.

As diabetes is a lifelong disorder, nutrition and exercise therapy become part of self-care education. People with diabetes have to understand the ways and means to alter their dietary habits and to adjust to deviations from their daily routine.

This article provides general guidelines about nutrients, diabetes-related nutrition and exercise therapy. Some common scenarios are also discussed.

BEFORE ADVISING THE DIET PLAN AND EXERCISE REGIMEN

It is important to make people with diabetes understand the need for alterations in their dietary habits. An understanding of the eating and cooking habits of the family, the type of food consumed and the normal pattern of meals, helps in planning nutritional therapy. A process involving the person with diabetes and his/her family in discussions regarding the appropriate diet to be consumed helps compliance. If people with diabetes are a part of this process, they would implement modifications more effectively in their daily routine. Decisions must not be forced on the patient. The factors that need to be taken into consideration before giving dietary advice include:

1. Type of diabetes mellitus, presence of co-morbid conditions and/or complications
2. Current drug regimen
3. Treatment goals, e.g. weight loss, target blood glucose levels, blood lipid levels, prevention of hypoglycaemia, etc.
4. Educational and psychosocial background of the person with diabetes
5. Willingness to follow advice and actual capability of the person to adhere to the advice based on his/her physical,

psychological, financial conditions and also his/her responsibilities towards work, family, etc.

PLANNING THE DIET

The pharmacokinetics of a person's medications need to be understood while individualizing the nutrition and exercise plan. People with diabetes should be explained the relationship between their medications and various nutrients and physical activity to prevent them from overdoing any aspect of the dietary and exercise plan. Based on the drug(s) that a person is receiving, alterations need to be made to the dietary plan. Some of these are:

1. Insulin sensitizers (metformin and glitazones): The total amount of macronutrients can be distributed over meals with greater flexibility without fear of hypoglycaemia.
2. Insulin secretagogues (sulphonylureas, glinides) and conventional insulin therapy: They must be prescribed snacks or split meal patterns to match insulin levels in the body as well as to avoid hypoglycaemia in later hours.
3. Bedtime glargine or detemir insulin: While most people do not need a bedtime snack, this should not be ruled out.
4. People on insulin lispro or aspart as their premeal insulin regimen do not need mid-morning and afternoon snacks, but if the bedtime insulin is either NPH or insulin-zinc suspension, they need complex or high fibre carbohydrates in their bedtime snack.
5. People receiving drugs which retard the breakdown and/or absorption of carbohydrates (e.g. alpha glucosidase inhibitors) should be prescribed a lower amount of fibre for the major meal with which the drug is taken and snacks with more fibre should be given.

The main considerations in prescribing macronutrients are explained in Table I.

Introducing low fat diets

1. Advise patients to reduce the use of oil and other fatty seasonings gradually so as to avoid aversion from foods cooked in very low quantities of fat.
2. Using less spices to match the small quantity of oil or other fatty seasonings gives an unchanged flavour to the dish and makes it equally palatable.
3. Use alternative methods of cooking such as non-stick utensils, boiling, grilling, etc.

Dietary fibres

Dietary fibres are a part of carbohydrates, but are considered non-nutritive as they do not provide any energy. Soluble or insoluble, they have been proven to be useful in various ways. Dietary fibres:

Nirmal Diabetes Clinic, # 371 (1st floor), next to Maitri Diagnostics,
BEML Main Road, New Thippasandra, Bangalore 560075, Karnataka,
India

TABLE I. Sources, examples and general considerations in prescribing macronutrients²

Source	Examples	Remarks
<i>Carbohydrates</i>		
Grains	Wheat, rice, millets, maize	Major staple food, must be prepared with whole grains to seek other micronutrients as well as dietary fibre.
Fruits	All fruits	A minimum of 1–2 whole fruits are recommended. Fruits juices, dry fruits or canned fruits are not recommended for regular use but can be useful in hypoglycaemia and during acute illness.
Vegetables	Starchy	Green peas, carrots, potatoes are examples of starchy vegetables. Patients should be familiarized with the food exchange system which allows them to eat starchy vegetables by reducing the proportion of starch from grains.
	Non-starchy	Non-starchy vegetables (e.g. leafy greens, okra, gourds) are not important glycaemically. They yield good quality fibre. Free consumption of non-starchy vegetables can be advised if vegetables are prepared with the least possible amount of fatty seasoning.
Milk	Milk and milk products	Skimmed milk, with the maximum fat removed from it, is a good source of carbohydrates, proteins and calcium. About 150–200 ml of milk or an equivalent amount of milk products are recommended for every major meal of an average adult.
<i>Proteins</i>		
Animal	Egg albumin, poultry, meat, fish, dairy products	Animal proteins should be processed with minimum fatty seasoning and cooked by grilling, boiling and microwave. Minimum 2–3 servings per day are recommended in place of plant proteins. Lean meat is preferred over red meat. Dairy products should be made from skimmed milk.
Plant	Nuts, legumes (lentils), grains	Nuts and legumes are the best vegetable proteins as they supply proteins along with good fat, fibre, vitamins and minerals. Grains are poor in proteins and must be complemented with other protein-yielding food items to obtain all essential amino acids. About 30–40 g of whole nuts and 100 g of legumes per day are recommended for an average adult. Vegetable and animal proteins should be used in an exchangeable manner and not together.
<i>Fats</i>		
Oils	Oils from plant seeds, fish oil	Oils balanced in fatty acids are good sources of fat. None of the processed oils, marketed as heart friendly, have been proven to be better in preventing cardiovascular risks. In the Indian setting, oils from regionally grown seeds (e.g. peanuts, sesame) have an acceptable balance of fatty acids and are recommended for use. Fish oil or flax seed oil are rich in omega-3 fatty acids and have been associated with good cardiovascular outcomes.
<i>Ghee</i> , butter		Though there are mixed opinions about using <i>ghee</i> and butter, these are high in saturated fats and must be used minimally.
Hydrogenated fat		Ready-made bakery products, biscuits and packed snack items are rich in hydrogenated fat, which is generally invisible and hence misleading. Warn patients against fried snack items with 'cholesterol free' labels on them.

1. Delay the absorption of macronutrients and hence prevent a postprandial blood glucose surge.
2. Help provide a feeling of satiety because of their bulk and prevent overeating.
3. Delay absorption and retard the breakdown of carbohydrates, thus maintaining postprandial blood glucose levels evenly over a period. In this manner fibres help reduce hypoglycaemic episodes.
4. Reduce hyperinsulinaemia and lipaemia.

Micronutrients

Much has been written and discussed about the use of micronutrients in people with diabetes. However, no study has proven the need to supplement micronutrients over and above the daily recommended requirements. Optimum micronutrients can be derived from a diet with an optimal composition of macronutrients and minimally processed food items. There may be a need to supplement micronutrients in individual patients, and this should be carefully evaluated.

Snacks or split meals

In India, traditionally, people are used to larger meals. For many people with diabetes, splitting a large meal into 2 small meals spaced at 3–4-hour intervals is advised. Alternatively, a healthy snack option (fruits, nuts, etc.) after a moderate meal can be introduced. The initial discomfort of 'not feeling full' can be overcome by giving options of eating low or non-caloric food

items such as vegetable salads, egg white, etc. A major meal and a snack following that meal should have a calorie and carbohydrate distribution in a ratio of 2:1. While some people feel eating frequently is socially unacceptable, it is important to emphasize the benefits of small, frequent meals and ask people to ignore the discomfort which is usually short-lived. The system of split meals or snacks has many benefits.

1. It improves postprandial glycaemic response.
2. It improves insulin sensitivity.
3. It helps match the pharmacokinetics of insulin or other insulin-secreting drugs and hence provides optimum glycaemia.

Food exchange

Food exchange, whereby one food item can be exchanged with another, provides variety and a balance of macronutrients in a fixed diet plan. Some examples are:

1. Instead of 2 whole wheat *chapattis* (60 g each), 1 *chapatti* and 120 g of cooked rice (1 full bowl) can be used.
2. A 110 g *jawar roti* (about 2 medium size, thin), or 1 restaurant *nan*/thick *roti* can replace 2 *chapattis*.
3. 200 g of the edible part of a watermelon (about 5–6 slices) can replace 1 whole orange (about 120 g) or 1 apple or 1 medium size banana or half a custard apple or a 90 g (small) *chicku*.
4. 4–5 whole almonds and 4 dry dates can replace 1 cup of coffee and 4 biscuits.

5. Half a *chapatti* or half a bowl of rice can be replaced with a scoop of ice cream.
6. In case an oily restaurant meal is taken, the quantity of oil and *ghee* in the next meal can be decreased.
7. 2 slices of bread in a sandwich (with a bit of butter and cucumber slices) can be replaced by 2 medium size *idlis* (30 g each) with vegetable *sambar*.
8. One boiled egg white can replace 50 g of boiled/grilled fish (2 small pieces) or a 50 g piece of chicken.
9. 1 bowl of sprouts with some onion and tomato can be exchanged with 1 bowl of curd and some salad.

Calorie requirements

For weight maintenance, about 30 kcal/kg/day are required for a person with moderate physical activity. For weight loss, a person must be given a 30 kcal/kg/day diet plan to start with. Subsequently, a slow reduction in calorie intake up to 20 kcal/kg/day along with moderate physical activity needs to be recommended during follow up visits.

EXERCISE

1. Nutrition therapy and moderate physical activities have been proven to reduce insulin resistance independent of weight loss.
2. Any aerobic exercise, moderate in intensity, lasting for 30–45 minutes per day, done for at least 5 days in a week considerably improves metabolism.
3. Aerobic exercises include brisk walking, cycling, jogging, dancing, swimming, etc.
4. To ensure medical fitness, people should be advised to start slowly and to keep increasing the intensity and duration of exercise gradually over a period of 15 days to 1 month.
5. General safety measures should be emphasized such as using good-fitting footwear, ensuring good vision, carrying an identity card and carbohydrate-rich food items while exercising, etc.
6. If any new symptoms appear, these need to be looked into and investigated, if necessary. These include chest pain, dyspnoea, pain in the lower limbs, blisters on the feet, an increase in hypoglycaemic episodes, etc.
7. Women with knee problems and people with a diabetic foot need to be encouraged to do upper body exercises.

People with type 2 diabetes mellitus

Though weight loss for people with diabetes has been a commonly expected end result of nutrition and exercise therapy, recent studies show that weight maintenance can also help improve insulin sensitivity and yield desirable metabolic goals.³ Some possible regimens that could be used for people with type 2 diabetes are shown in Figs 1–3.

People with type 1 diabetes mellitus

Carbohydrate counting is a method of carbohydrate monitoring whereby bolus doses of insulin are matched to the amount of carbohydrates eaten per meal. This method has been proven to be helpful for people with type 1 diabetes to achieve optimum blood glucose control and a good quality of life.⁴

Though initially people with type 1 diabetes do not present with metabolic disasters such as insulin resistance and lipid disturbances, it is wise to introduce a habit of healthy diet patterns to avoid future weight gain and other metabolic derangements (Fig. 4).

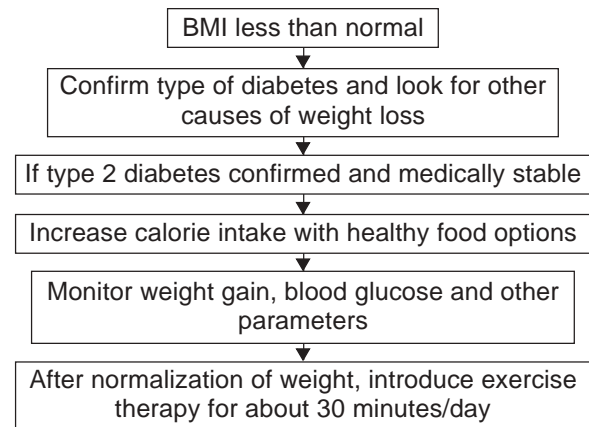


FIG 1. Suggested plan for nutrition and exercise for people with lower than normal body mass index (BMI)

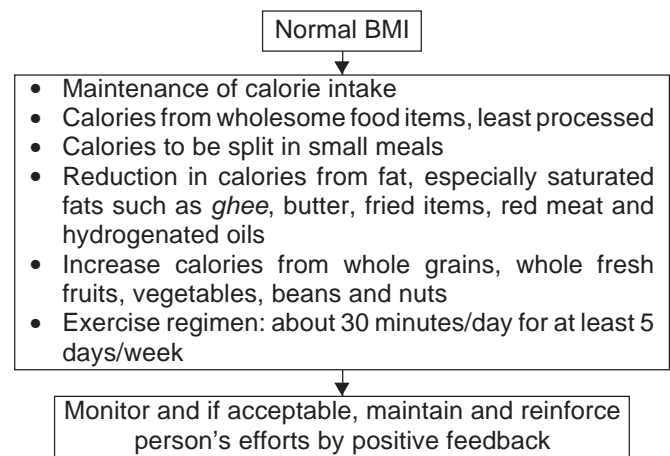


FIG 2. Suggested plan for nutrition and exercise for people with normal body mass index (BMI)

Gestational diabetes

Diabetes during pregnancy needs stricter blood glucose control. The physical need for calories should be considered similar to those for pregnant women without diabetes. Pregnant women with pre-existing diabetes and those with diabetes detected during pregnancy need to be offered slightly different nutrition and exercise therapy (Figs 5 and 6).

Elderly people with diabetes

If not contraindicated due to medical reasons, elderly people with diabetes will benefit from a regular exercise and nutrition plan, and this will improve insulin sensitivity.² Weight loss along with muscle wasting, co-morbid conditions, joint problems, and visual and mood disturbances are some of the common problems. Based on the support system available to an elderly person, nutrition therapy and light or modest physical activity can be introduced. Frequent small meals make them feel better. Close monitoring of vital signs is always required.

People with micro- and macrovascular complications

One microvascular complication such as diabetic nephropathy, when detected in a person with diabetes should warn the physician and the person with diabetes of the possible future detection of

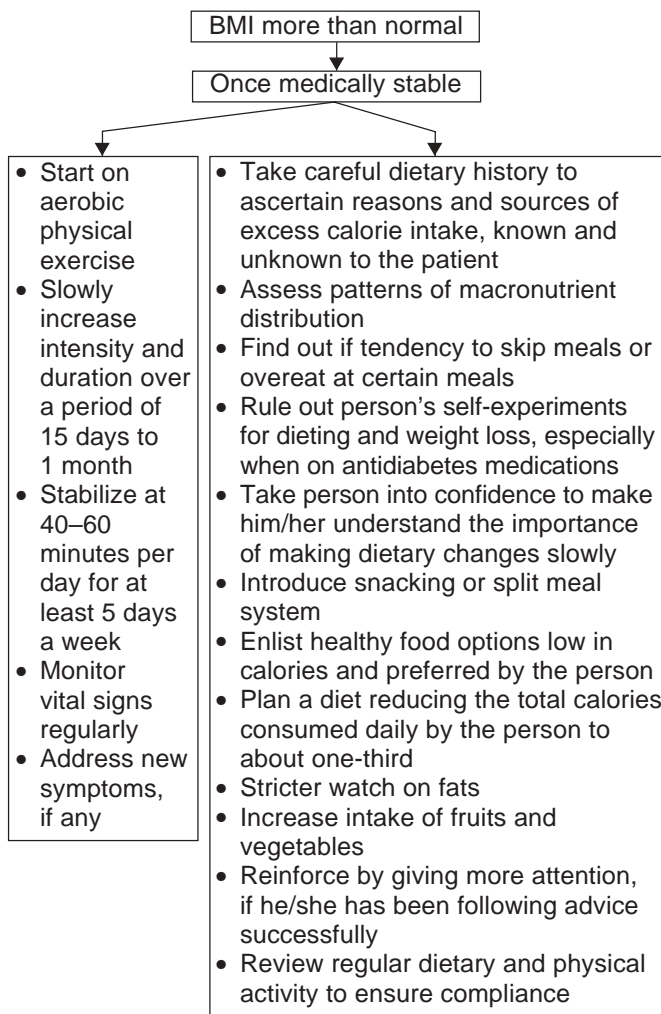


FIG 3. Suggested plan for nutrition and exercise for people with a higher than normal body mass index (BMI)

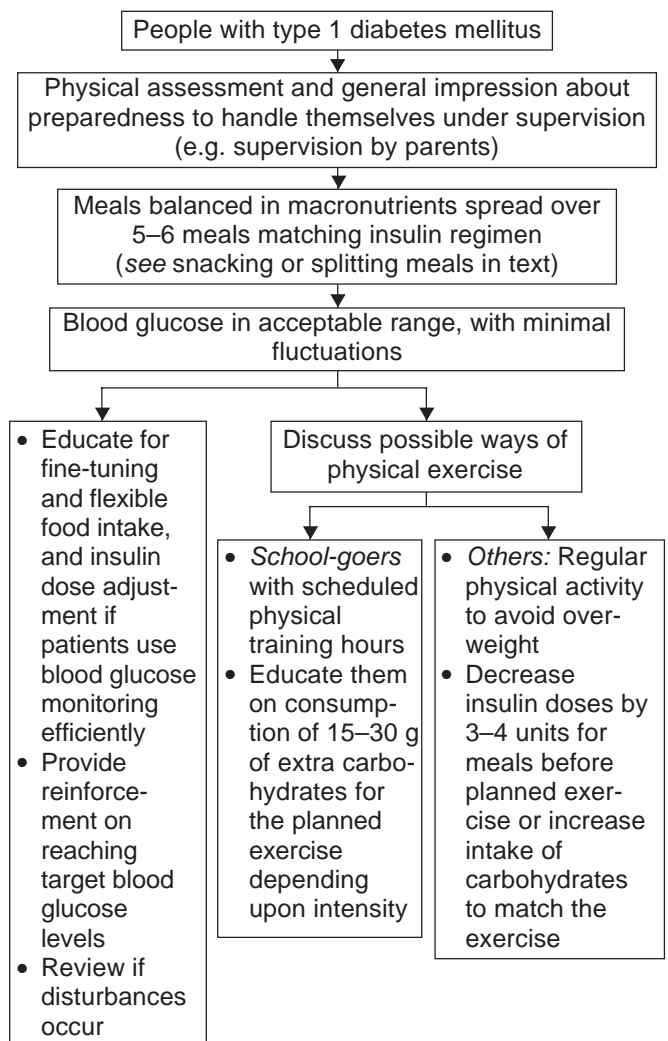


FIG 4. Suggested plan for nutrition and exercise for people with type 1 diabetes

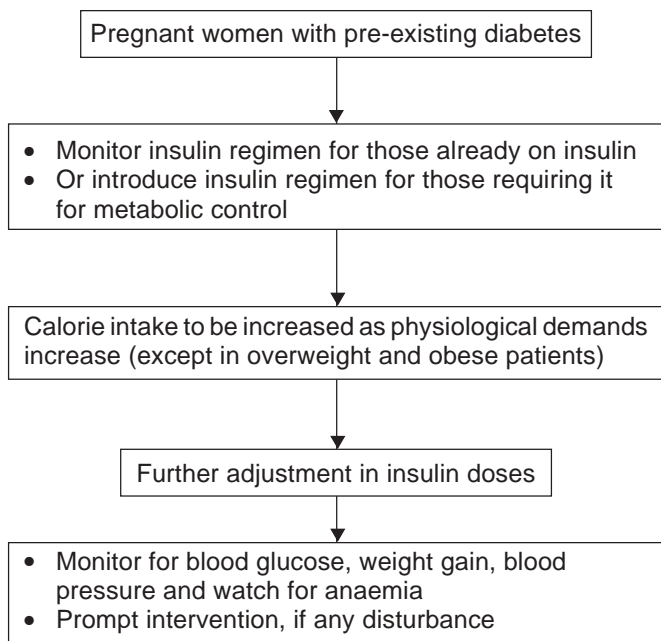


FIG 5. Suggested plan for nutrition and exercise for pregnant women with pre-existing diabetes

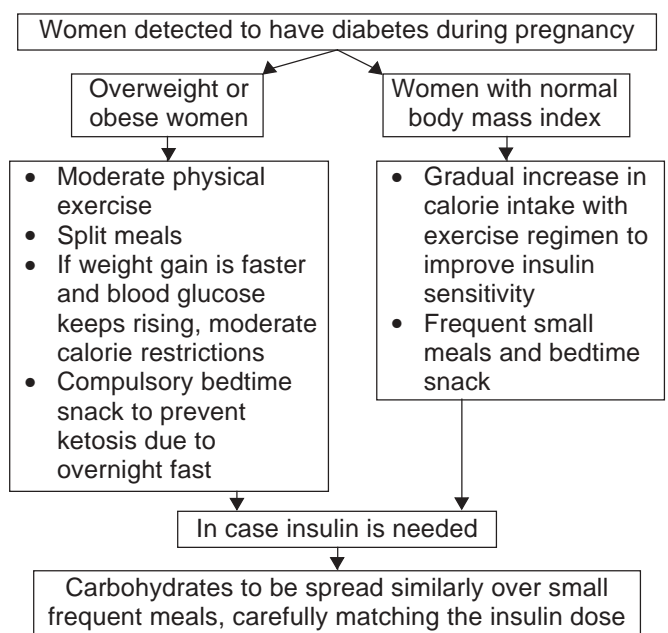


FIG 6. Suggested plan for nutrition and exercise for women detected to have diabetes during pregnancy

other microvascular complications (e.g. diabetic retinopathy). The same is true for macrovascular complications. Hence, specific dietary interventions are essential in people who are likely to develop vascular complications. These include:

1. Protein restricted diet (about 0.8 g/kg body weight/day) with minimal animal proteins slows the progression of nephropathy. A higher carbohydrate diet should be given to these people. Grains are poor in proteins and should be preferred to meet the requirement of carbohydrates.
2. Salt restriction helps drugs reduce the proteinuria and has a positive haemodynamic effect on the kidneys. Slow reduction helps people to get used to a low salt diet.⁵
3. Fats from any source have to be reduced as mentioned previously. For a person with an average BMI, a total of 10–15 ml of oil or *ghee* can be allowed, spread over all the meals.
4. Fruit and vegetable juices need to be avoided to deal with electrolyte imbalance in people with nephropathy. However, regular fruit and vegetable intake does not need to be changed.

CONCLUSION

A balanced mixing of nutrients spread over all the meals, individual food choices and exercise options should be given to people with

diabetes to achieve their target health goals. Without constant support to the patient and regular follow up, nutrition therapy and physical exercise have a lower success rate.² Therefore, people with diabetes should be frequently assessed for their compliance to the diet and exercise schedules and the problems encountered by them should be addressed. Good results must be reinforced to achieve appropriate benefits.

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