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**Dietary Approach for the Prevention of Diabetes**

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**ABSTRACT**

*Diet plays an important role in the treatment of diabetes. The diet may be used alone or in combination with insulin injections or oral hypoglycemic drugs. A diabetic diet should consist of a good combination of nutrients i.e. carbohydrates, protein, fat, vitamins and minerals to stay fit and fine and to keep the blood sugar levels in check. 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:*

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

**Keywords:** *Diabetes; Insulin; Fenugreek; Bitter Gourd; Pectin.*

**1.0 Introduction and literature Review**

Diet plays an important role in the treatment of diabetes. The diet may be used alone or in combination with insulin injections or oral hypoglycemic drugs. A diabetic diet should consist of a good combination of nutrients i.e. carbohydrates, protein, fat, vitamins and minerals to stay fit and fine and to keep the blood sugar levels in check. 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:

- a) Determining energy requirements
- b) Determining the type of carbohydrates, fiber and food preparations
- c) Presence of any other complication such as high blood pressure, high cholesterol levels etc. Diabetes menu planning is an also an excellent way to keep track of calories. The average person should consume about 2,000 calories per day to ensure that their body functions properly and they have enough energy to be active.

There are two types of diets measured and unmeasured. In measured diets the portion of food

may be measured either by weighing with scales or more simply by using household measures. Measured diets are required for patients who require insulin or an oral hypoglycemic agent and also for those who are overweight and require a reducing regimen. Unmeasured diets - If insulin or oral hypoglycemic agents are not required and obesity is not marked, it may not be necessary for the patient to follow such an accurate diet.

**2.0 Nutritional Needs**

Dietary control is an integral part of management for the diabetic. The diet should always provide the essentials of good nutrition and adjustments must be made from time to time for changing metabolic needs. For example during growth, pregnancy, lactation or modified activity.

**A. Proteins:** Since diabetics in general are in negative nitrogen balance they should receive about twice as much protein as normal subjects.

The proteins should be of high biological value and provide about 20 - 25 % of the calories in the diet. A diet high in protein is good for diabetics because

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- 1 It supplies the essential amino acids needed for tissue repair.
- 2 Protein does not raise the blood sugar during absorption, as do carbohydrates.
- 3 It does not supply as many calories as fats.

**B. Carbohydrates:** The daily intake of carbohydrate should provide about 40 % of the calories to prevent ketosis. Several studies shown that raising the carbohydrates intake does not adversely affect blood glucose levels, glucose tolerance, or insulin requirements provided that total calorie are not increased.

**C. Fats:** After protein and carbohydrates levels have been established the fat allowance makes up the remaining calories for most diets. 30 - 35 % of the calories as fat are satisfactory. Foods high in saturated fat and cholesterol should be limited.

**D. Fiber:** Foods those are rich in fiber can reduce the rate of glucose absorption, lower blood sugar rise, decrease urinary glucose excretion, slower stomach emptying and delay intestinal transit time. Fiber also contributes to satiety and consequent decreased food intake helps reduce weight. This fiber containing complex carbohydrates that are slowly digested and absorbed such as pulses, brown rice, bread, chapathy will produce less rise in blood sugar and less excretion of urinary sugar than an equivalent amount of carbohydrates taken as sugar in tea. The fiber particularly the gums, pectin's when ingested with a diet are reported to reduce post prandial glucose levels (after food) in blood. Studies have shown that gum present in fenugreek seeds (it contains 40 % gum) is most effective in reducing blood glucose and cholesterol levels as compared to other gums. These types of dietary fiber are often recommended for the management of certain types of diabetes.<sup>2</sup>

**3.0 Calculation of Diabetic Diet**

Let us assume that a diet is to be planned for a person who is 25 years old and 165 cm tall. According to her height her desirable weight is 60 kg. Calories required for per kg body weight is 30.

Calories	$60 \times 30 = 1800 \text{ kcal / day.}$
Protein	20-25 % of total calories
	$1800 \times 20\% = 360 \text{ kcal.}$
	$360 \text{ kcal} / 4 = 90 \text{ gm / day}$
Carbohydrates	40% of total calories
	$1800 \times 40\% = 720 \text{ kcal}$
	$720 / 4 = 180 \text{ gm / day}$
Fat	Total calories - calories from protein and carbohydrates
	$1800 - (360 + 720) = 720 \text{ kcal.}$
	$720 / 9 = 80 \text{ gm fat / day.}$

**4.0 Some Important Tips for Diet**

1. Fenugreek (methi) is the best for diabetic people. You can fry and powder it and daily consume one spoon. You can mix fenugreek with milk and add curd and keep it in the night. Next day the fenugreek curd may be consumed. It is also noted that gulping a few of these seeds along with water on an empty stomach early morning will do wonders and will help you control diabetes effectively.
2. For breakfast I would suggest sabudana khichdi as it is very light and easy to digest. Upmaa is also good for diabetic patients. Avoid banana and have citrus fruits. 3. Befriend bitter gourd (karela) as it helps in lowering blood sugar efficiently.
3. Garlic is rich in potassium and it helps in replacing the potassium that you lose out in your urine. It also has sulfur and zinc which are components of insulin.
4. Of all the fruits, apple is the one with all the valuable nutrients. Apple is rich in pectine, which is found in its pulp. This pectine is the source of galacturonic acid, which is needed for cleaning the harmful, toxic substances from your body. This acid also works in the direction of decreasing your body's need of insulin by around 35%. Besides being rich in pectin, apples are also rich in Vitamin B1. Vitamin B1 prevents the damage of the brain cells that can occur due to diabetic acidosis. It also prevents further complications such as neurosis. So the saying goes apt "An apple a day keeps the doctor away."
5. Apart from apple, grapefruit has several appetizing properties that help you fight diabetes. Its refreshing nature helps you to bring down your blood glucose levels within a time span of just three days. But just a diet of grapefruit is not enough. With it you will be required to take more of vegetables and fruits rather than diet rich in fats.
6. Include lot of fiber in your diet. An ideal diabetic diet chart is the one which has soluble fibers that are found in food sources like apples, soybean, oatmeal, and kidney beans as these help in slow digestion and the right absorption of nutrients. Slow absorption of nutrients will mean slow

7. release of glucose which is essential for those suffering from diabetes.
  8. Including flaxseed (patasan ka seed) in your diet is a good idea as it will help in maintaining the sensitivity of the cell membrane and will facilitate insulin production.
  9. If you feel like eating rice, then choose brown rice instead of white rice.<sup>3</sup>
  10. Vegetables Low In Carbohydrates - such as greens, cauliflower, broccoli, green peppers, celery, asparagus, cabbage, mushrooms and more.
  11. Fat – Coconut Oil, Butter, Rendered Fat (such as bacon grease or lard).
  12. Drinks – water, unsweetened tea and coffee with heavy cream only – Do NOT use non-dairy liquid or powdered creamer.
  13. Condiments/Spices – Tony Chachere’s, Tabasco, Texas Pete (1 g per serving), Black and Red Pepper, Paprika, Cumin
  14. Vinegar – apple cider on salads or greens.
  15. EVOO – Extra Virgin Olive Oil, on salads or slaw but also for low to medium temperature cooking.
  16. Nuts – walnuts, pecans, cashews, almonds, etc. (except peanuts)
  17. Low Carb Fruits – not daily and in small portion. avocado and tomato.
  18. Alcohol – Wine – once a month you can drink wine, always red and usually a Merlot or Cabernet Sauvignon.<sup>4</sup>
5. Foods to Be Avoided
1. Avoid roots and tubers e.g.: potato, sweet potato, colocasia, yam, tapioca
  2. Avoid sugar, glucose, jams, jaggery, honey, sweets, nuts, chocolates, candies, Horlicks, Bournvita, etc.
  3. Avoid fried foods.
  4. Include salads but no salad dressing like mayonnaise.
  5. Dietary exchanges should be taken into consideration.
  6. Avoid alcohol.
  7. Avoid fruits such as mango, banana, chickoo, sapota, custard apple and other fruits that are high in sugar levels.

## 6.0 Foods to Be Restricted

1. Potatoes, yam, arbi, sweet potatoes, mangoes, grapes, bananas, alcoholic beverages, fried foods, paranthas, poories, pakoras, mathris, deep fried foods, dry fruits, salad oils, cakes and pastries.
2. Quantity of oil should be restricted.
3. Carrot can be consumed.<sup>5</sup>

## 7.0 Foods to Be Used Freely

1. Green leafy vegetables, tomatoes, cucumber, radish, soups, buttermilk, tea and coffee without sugar.
2. Include food rich in fiber.

### 7.1 Important thing to remember for diabetes patient:

1. Exercise regularly and your life will become organised. Simple walking, yoga and any other suitable exercise not only helps in lowering the sugar level but also keeping the body weight down, strengthening the heart and lungs and keeping the metabolism in order. 6 2. 35-40 minute faster walk do suryanamaskara 10 times, try to practice pranayama every day.
3. Diabetic person should eat food between times intervals like take breakfast in morning, lunch, some snacks and dinner.
4. Avoid oily food.
5. Intake more fiber foods in meals. It increases glucose level gradually in blood and keeps control.
6. Do not take fast and also don’t go much party. Remember meals should not be missed.
7. Diabetic person should eat food slowly,
8. It is important to control the amount and time of food intake.
9. Consider the likes and dislikes of the patient.
10. Try to substitute the craving for sweet by taking some fruit.
11. Using an exchange list can be helpful in maintaining variety in food intake while ensuring the appropriate mix of carbohydrates, proteins, calories, and other food nutrients.<sup>7</sup>
12. Fruits have shown various beneficial effects on a patient suffering from diabetes. They are low

on fats and highly rich in nutrients and vitamins and have positive effect on the abnormal rise in the blood glucose levels. You can choose from any of the fruits available in the market. Each one of it will be better than the other.

13. You need to consume food in small quantities at regular intervals.
14. Make sure you include ample fluids (sufficient fluids) in your daily diabetic diet chart. This will ensure that your body is well hydrated. Remember to drink two 8-ounce glasses of water with each meal.<sup>8</sup>
15. You should have dinner 2 hrs before sleep and sleep max 10.00 pm.
16. Have a 30ml of Bitter gourd juice twice in a week. (Take 200 to 300 gram of the same (Karela) make piece, put it in a mixer, mix and filter, and keep in a bottle and use)

**8.0 Type of Carbohydrate And Amount of Fibre**

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 fibre in complex carbohydrate like grains, vegetables and other starches slows the glucose absorption. One should emphasise more on the high fibre foods instead of high fibre supplements available in the market.<sup>9</sup>

Food groups	High fibre foods	Low fibre 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
fish and poultry	-	Eggs, chicken, fish
Vegetables	like peas, beans, lotus stem etc.	like potato, lauki etc.
Fruits	Fruits like apple, cherries, pears, peaches, plums, guava etc.	Fruit juices and fruits like banana and papaya
Fats	-	Fats

A proper diet that is based on a diabetic diet chart combined with a light exercise regimen will definitely help you. Hope this will help and it is only you who can help this problem, no amount of recommendations from anyone can help if you are not honest with the food that you consume, since this disease is nutrition related.<sup>10</sup>

**9.0 Sample Diet Plan**

Meal	Menu
Early morning (at 6 am)	½ teaspoon fenugreek (methi) powder + water
Morning (at 7 am)	Tea (preferably without sugar) with 1-2 mary biscuits or Limejuice
Breakfast (at 8.30 am)	(a) 1 plate upma or oatmeal + half bowl sprouted grains + 100ml cream-free milk without sugar; (b) Dalia (salted)/ Paneer on toast; (c) Tea without sugar/ skimmed milk with Apple/ Corn flakes/ Boiled egg
Mid-morning	Fruit chat/ Musambi/Orange or 1 cup thin and sugar free buttermilk
Lunch	2 chapatti and Channa curry / or any other whole dal; Beans sabzi / or any other sabzi (avoid potatoes)/ or methi sag; Curds / ghia raita; Salad (radish, onion, cucumber, tomato)
Tea	Tea with Salty biscuits/ or Vegetable sandwich
Dinner	Vegetable soup / or tomato soup chapatti / missi roti (combining wheat flour with channa flour and soya flour); Palak paneer sabzi / paneer bhurji and Curds
Bedtime	Skim milk (Without sugar) <sup>10</sup>

## 10.0 Diabetic Diet Chart

Opt ion	Early Morning	Breakfast	Mid Morning	Lunch	Evening	Dinner	Bedtime
1	Tea or Coffee (with 1% fat milk)	Wheat flakes, 1 % fat milk	Apple	Brown Rice, Mixed Veg Khadi (no pakora), Bhindi sabzi/palya, Cucumber salad,	Sprouted Black Channa Chaat	Whole Wheat Phulkas/ Rotis (no oil/ghee), Palak tofu, Mixed Veg Salad, Yogurt (Fat	Milk (1%fat) (Without sugar)
2	Walnuts	Veg upma (less oil)	Apricot	Buttermilk (Chaach) Whole Wheat Phulkas/ Rotis(no oil/ghee), Carrot Peas Sabzi/palya, Dal fry, Tomato raita	Baked Vegetarian Cutlets	free) Brown rice, Capsicum Curry, Veg Sambar, Tomato salad, Yogurt (fat free)	Milk (1%fat) (Without sugar)
3	Karela juice	Vegetable sandwiches (100% whole wheat bread)	Grapefruit	Kichidi (with mixed veg), Khadi (no pakora), Steamed broccoli( with salt/pepper)	Sprouted Moong Dal	Ragi Rotis, Dal Palak, Beans Sabzi/palya, Mixed Veg raita	Rusks with sugar free tea
4	Green tea	Dalia porridge, (with 1% fat milk,no sugar)	Cherries/p lums/Papa ya	100% Whole Wheat Roti, methi sag/beans sabi/whole dal, Curd/ ghia raita, Green Salad	Idli with sambar or Tea with vegetable sandwich	Brown rice, Collard Greens Sabzi/palya, Channa masala, Cabbage and green papaya salad	Milk (1%fat) (Without sugar)
5	Wheat grass juice	Oatmeal porridge (with 1% fat milk, without sugar)	Guava/ pears	Tomato soup, Wheat Rotis, radish/ cabbage/ beans, Salad, Yogurt (fat free)	Baked Beans on toast (100% wheat bread)	Missi roti, Dal masoor/ palak paneer sabzi, curd, Cucumber salad	Milk (1%fat) (Without sugar)
6	Karela juice	Oatmeal porridge (with 1% fat,without sugar)	Apple/gua ba	Brown Rice, whole dal, Curd/ ghia raita, Green Salad	Tea with Sprouted Moong Dal	Whole Wheat, Veg Sambar, Tomato salad with raita	Rusks with sugar free tea
7	Green tea	Vegetable sandwiches (100% whole wheat bread)	Cherries/p lums/Papa ya	Kichidi (with mixed veg), Khadi (no pakora), Steamed broccoli( with salt/pepper)	Baked Vegetarian Cutlets	Sabzi/palya, Channa masala, Cabbage and green papaya salad	Milk (1%fat) (Without sugar)

When, you feel hungry intake raw vegetables, salad, black tea, soups, thin buttermilk, lemon water etc.

## 11.0 Conclusion

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia & is associated with abnormalities of carbohydrate, fat, and protein metabolism that results from defects in insulin secretion, insulin action (sensitivity), or

both. Diabetes result in chronic complications like microvascular, macrovascular complications if hyperglycemia is not controlled. General approach of treatment includes both pharmacological therapy and non pharmacological therapy. Pharmacological therapy includes oral hypoglycemic agent and insulin drug regimen. Non-pharmacological drug therapy includes life style modification. Life style modification includes aerobic exercise for 30 minutes per day along with restricted specific diet for obese patient or balance diet for lean body habitus patient.

Diabetic diets are very essential weapon for maintain the blood sugar level at desired level along with drugs and aerobic exercise. Medical nutrition therapy is recommended for all diabetic patient. For the individual with type 1 DM, the focus is on regulating insulin administration with balanced diet to achieve and maintain body weight. A meal plan that includes moderate in carbohydrates and low in saturated fat, with a focus on balanced diet is recommended. In addition patient with type 2 DM often requires restricted diet to promote weight loss. Saturated fat should be minimized. Fruits and vegetables rich in fibre should be include in diet.

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