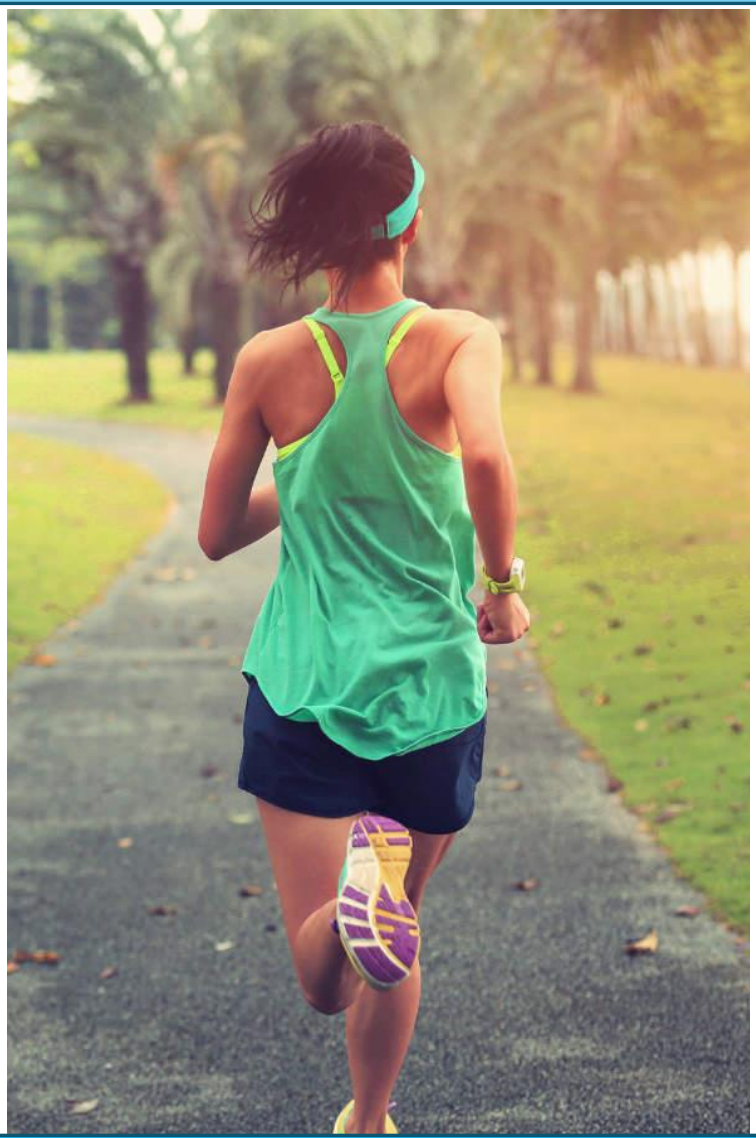
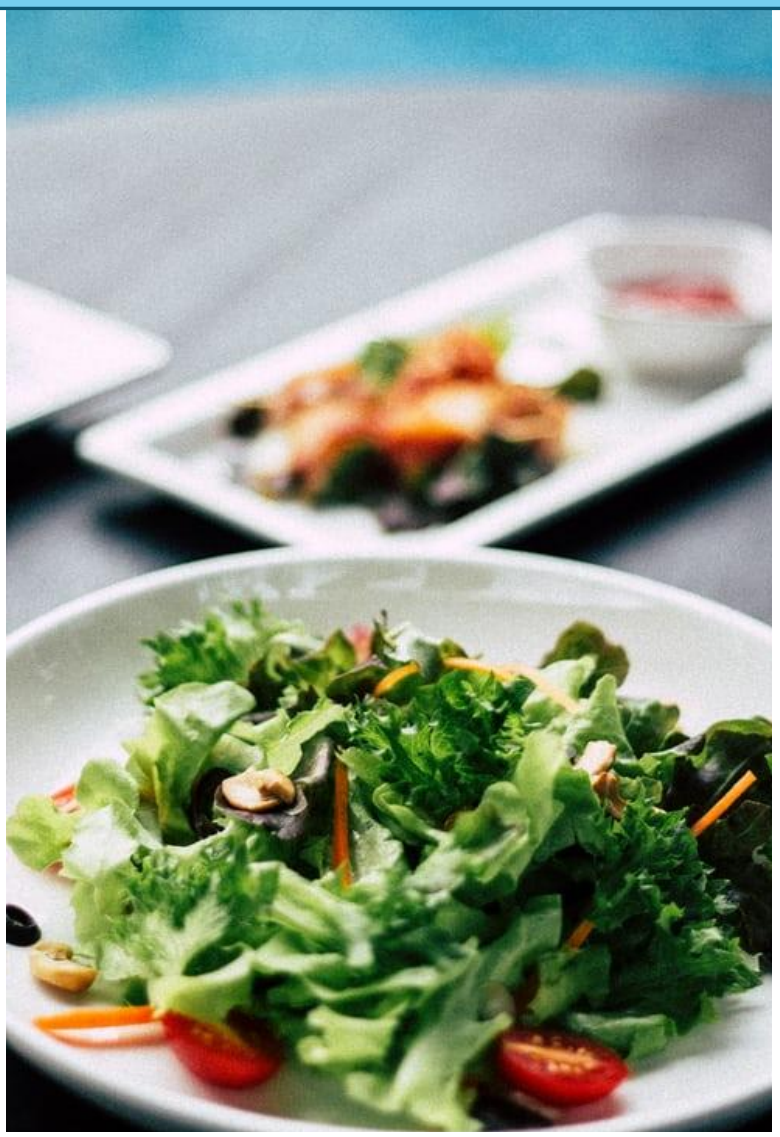
INDIAN DIABETES AND CARDIO-METABOLIC DISEASES ASSOCIATION

A Practical guide to diet and exercise for diabetic individuals





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Preface

As we all are very much aware that diabetes is a chronic metabolic disease that is spreading fast like an epidemic and raising concern all over the world. The most common form of diabetes is type 2 diabetes and the most common factors involved in this disease are lifestyle-related factors that include our dietary pattern and sedentary lifestyle. We doctors try our best to educate our diabetic patients about the role of these factors in their disease management. Still we find that many patients are not getting the right answers about certain foods and exercise-related facts. They are mostly not getting properinformation or are getting misguided by people around them. So, the motive of our writing this small, yet very useful booklet for our diabetic patients is to guide them in a proper scientific and evidence-based way about different facts of foods to be eaten so that they can choose their food wisely in their routine life. We also intent to educate them regarding exercise related recommendations and empower them about self-management of diabetes mellitus throughout their life so that they could live a normal life as close as possible to non-diabetic people.

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Diet and diabetes

Dietary advice given to every diabetic patient:

Know your type of food: all foods are divided into following groups

1)Cereal grains



- Wheat flour: You can eat whole wheat flour only (no refined flour or Maida)
- Oats: allowed
- Millets:Barley /Bajra/ Jowar all allowed. Kodri (foxtail Millet) is a type of millet similar to barley. It contains good dietary fiber and has low GI.
- Flour of gram=besan allowed
- Sweetcorn flour not allowed or allowed in a limited amount as specified
- Semolina(suji): use in a restricted way

what are whole-grain cereals: that contains all three layers of grain

Use cereal and pulse combination for low GI.Cereal ¾ + pulses ¼ example: wheat + soyabean or besan atta

2) rice grains:

- Little rice or no rice
- Eat Quinoa: This is a gluten-free seed that can make a great substitute for rice and other grains.

- can eat brown rice or parboiled rice in moderation

3) legumes andPulses grains:

They are commonly known as the legume, pea, or bean belong to Fabaceae or Leguminosae family a family of flowering plants.Although used interchangeably, the terms “legumes,” “pulses,” and “beans” have distinct meanings.

A legume refers to any plant from the Fabaceae family that would include its

- leaves,
- stems, and
- pods.

A pulse is an edible seed from a legume plant. Pulses include

- Beans (kidney, black, pinto, navy, chickpeas, etc)
- Lentils (dals in India):
- and peas.

For example, a pea pod is a legume, but the pea inside the pod is the pulse.

- Eat all pulses including rajma and chhole and soyabean
- What about dried peas=safevatana: avoid use in limit

4) **Fruits**:


- Preferred Fruits: pear/apple/guava/jamun/strawberry/pomegranate/Indian Jujube(Ber) etc.
- Eat in moderation : Papaya/Watermelon / Kiwi/Muskmelon/Pineapple
- Other fruits: use with low GI and in restricted amt as specified e.g.
    - Mango: 2 pc per week
    - banana, 2 pc/week
    - grapes 4 pc 3 times a week
    - sitaphal, avoid
    - Avoid – sapota or chikoo (it is a high-caloric fruit)

5) **Vegetable**:


- Avoid: potato/ sweet potato/other sugar-rich veg likeYum(Suran), Arbi, Banana
- Allowed all other vegetablesincluding pumpkin and Salad: cucumber/broccoli/Shimla mirch all 3 colours/onion/tomato
- legumes:

6**) Nuts and seeds:** mix 100 grams of each


- Pumpkin seeds
- Flax seeds
- Watermelon seeds
- Almonds and
- walnuts (more almond less walnut)
- Chia seeds

Eat 1 teaspoon 3 times a day

7) Sugar:

- Any kind of sugar jaggary not allowed
- But you can use artificial sweeteners and stevia in a moderation

Artificial sweetenersare synthetic chemicals that make things taste sweet without any extra calories.Artificial sweeteners taste sweet because they are recognized by the sweetness receptors on your tongue. They provide virtually zero calories, as your body can't break them downMany types of artificial sweeteners exist, but not all are approved for use in every country. The most common ones include

- ❖ aspartame,
- ❖ sucralose,
- ❖ saccharin,
- ❖ neotame, and
- ❖ acesulfame potassium and
- ❖ now the new herbal sweetener Stevia.

Recent studies have found that replacing sugary foods or drinks with artificially sweetened ones may

- ❖ Reduce hunger and calorie intake and may help you lose some weight and

- ❖ Can help those with diabetes reduce their intake of added sugar and hence help in blood sugar control.
- ❖ when consumed instead of sugar, decrease the likelihood of tooth decay so beneficial for dental health.

Artificial sweeteners are unlikely to

- ❖ Increase your risk of metabolic syndrome or
- ❖ Increase the risk of cancer in humans or
- ❖ Cause headaches, depression, or seizures.

However, some individuals could be more sensitive to these effects than others.Artificial sweeteners may disrupt the balance of gut bacteria in some people, which could increase the risk of disease. However, more studies are needed to confirm this effect.Artificial sweeteners are generally considered safe but should be avoided by people who have phenylketonuria or are allergic to sulphonamides.Overall, the use of artificial sweeteners poses few risks and may even have benefits for weight loss, blood sugar control, and dental health.These sweeteners are especially beneficial if you use them to decrease the amount of added sugar in your diet and use them judiciously in the least dosages.The likelihood of negative effects can vary from individual to individual and depends on the type of artificial sweetener consumed.Some people may feel bad or experience negative effects after consuming artificial sweeteners, even though they are safe and well-tolerated by most people.If you'd like to avoid artificial sweeteners, try using natural sweeteners instead.

What about honey? Can it be substituted for white sugar?

It's a controversial subject!honey has both low GI and low to moderate GL than white sugar and Honey was used in folk medicine for a long time, but the health benefits were explained in the last decades. Considerable evidence from experimental studies shows that honey may provide benefits in the management of diabetes mellitus. The benefits could be a

- Better control of the hyperglycaemicstate (i.e.,hypoglycaemic effect of honey, but the mechanism of this effect remains unclear),
- limiting other metabolic disorders and
- diminishing the deleterious effects on different organs that may produce diabetic complications.

The experimental studies completed in recent years, support honey as a novel antidiabetic agent that might be of potential significance for the management of diabetes and its complications.

There are some data and literature with contrary discussions regarding the use of honey in diabetic diseases.The result of one study showed that 8 weeks' consumption of 50 g/day honey increased HbA1c of patients with type 2 diabetes. Honey treatment also decreased waist circumference and waist-to-height ratio compared to the control. Although diminution of waist circumference may have favorable metabolic consequences, the increment of HbA1c may result in exacerbation of diabetes complications, suggesting that honey need to be consumed with caution by patients with type 2 diabetes. (source: Effect of Natural Honey on Glycaemic Control and Anthropometric Measures of Patients with Type 2 Diabetes: A Randomized Controlled Crossover Trial Published online 2019 Jan 15. doi: 10.4103/ijpvm.IJPVM_109_18)

Honey may indeed be used as a potential antidiabetic agent that has the potential to reduce the complications of diabetes, long-term studies using honey as an alternative or a complementary therapy in human subjects suffering from type 2 diabetes mellitus are neededandsince no conclusive data is available so far, we recommend that there's no advantage to substituting honey as a sweetener in a diabetes eating plan. Both honey and sugar will affect your blood sugar level.Honey is sweeter than white sugar, so you might use a smaller amount of honey instead of sugar in some recipes. But honey has slightly more carbohydrates and more calories per teaspoon than does white sugar, so any calories and carbohydrates you save will be minimal.Also pure honey is difficult to get, and most of honey available in market is already adulterated with sugar and other chemicals

If you prefer the taste of honey, go ahead and use it but only in moderation. Be sure to count the carbohydrates in honey as part of your diabetes eating plan.

source:Honey and Diabetes: The Importance of Natural Simple Sugars in Diet for Preventing and Treating Different Type of Diabetes Published online 2018 Feb 4. doi: 10.1155/2018/4757893 by Otilia Bobiş, 1 Daniel S. Dezmirean, 2 and Adela Ramona.

What about jaggery?

Jaggery has a high glycaemic index. It is a form of sugar that gets absorbed rapidly and can spike your blood sugar levels. Many diabetic patients are under the misconception that

jaggery is a safe replacement for sugar however that is not true, so better you should avoid jaggery.

What about dates?

A certain variety of Dates have a low GI (glycemic index), which means they're less likely to spike your blood sugar levels, making them a safe choice for people with diabetes.But dates have a medium GL (glycemic load), which means that maximally upto 2-3 fruits at a time are a good choice.

8) Oil and ghee group:

- Visible fat: Stop: Trans fate.g.,Vanaspati/desi ghee (cow or buffalo)
- Hidden trans and Saturated fate.g.,pizza, pasta,pastry, sweets, cookies, all sugary items etc. avoid (almost all the fast foods, namkeens, sweets commercially available)
- Refined oils allowed
- Do not reuse cooked oil

9) Meat and poultry:

Stop: Red meat (goat/cow and pig meat (mutton beef and pork)

Eat freely:

- Chicken (roasted)
- fatty fish/fish
- egg: one egg with yolk and rest of the eggs without yolk

10) Dairy products:

- Milk: fat-free toned milk/skimmed milk
- Cheese eats in a controlled way (should be prepared from skimmed milk)
- Paneer: eat in a controlled way/fat free paneer you can eat
- Curd: low fat
- avoid butter.

11) Beverages:

What Can I Drink If I Have Diabetes?

No doubtWater is the perfect drink. It doesn't have calories, sugar, or carbs, and it's as close as the tap. If you're after something tastier, though, you've got options. So, the safe drinks are as follows

Water, Unsweetened tea or coffee, Tomato or vegetable juice or soups, Sugar-free drinks (carbonated beverages or energy drinks) Coconut water, Buttermilk prepared from skimmed milk, Dal water, Lemon Juice.Some tempting or seemingly healthy drinks aren't great for you, but you can make swaps or easy homemade versions of many of them. These tasty treats can fit into your diabetes diet and still satisfy your cravings. However, if you are making a novel drink of your own, it is better to discuss the ingredients of the drink with your dietician or diabetologist and take their approval before finalizing the drink and taking it.

what about alcohol?? can a diabetic person drink alcohol??

Alcohol intake significantly increases the risk of hypoglycemia (low blood sugar levels).

Hence People with diabetes cannotdrink irresponsibily andthey need to be extra careful with alcohol. Butthere is no need for people with diabetes to give up alcohol simply because of their diabetes. With a few precautions and careful management, people with diabetes can also enjoy a drink.There are also alcohol substitutes for those who abstain.Different alcoholic drinks will have varying effects on your blood sugar It also depends on how much you drink. A single alcoholic drink (a 330ml bottle of beer, a medium glass of wine) may not have a huge effect on your overall blood sugar.

Health hazards of heavy drinking in a diabetic person

- If you have more than a single drink, most alcoholic drinks will tend to initially raise your blood sugar. Typically, beers, lagers, wines, sherries, and other alcoholic liquors will have this effect. However, alcohol inhibits the liver from turning proteins into glucose which means you’re at a greater risk of hypoglycemia once your blood sugars

start to come down. If you have a number of these drinks, you can expect to see a rise in blood sugar followed by a steady drop several hours later, often whilst asleep. People who take insulin, in particular, therefore need to be wary of hypoglycemia. Alsoalcohol may enhance the hypoglycemic effects of several oral anti-diabetic drugs and suddenly reduce blood sugars.

- Alcohol-induced intoxication may mask the usual symptoms of low blood glucose levels.The symptoms of drunkenness can be very similar to a hypo, which can lead to very dangerous confusion. Furthermore, if you have been drinking heavily, there may be a risk of hypos for up to 16 hours (or even more) after you have stopped drinking. Monitoring blood glucose levels closely is an essential part of managing your diabetes in this situation.
- Alcohol is probably a risk factor in the development of diabetic retinopathy.
- Alcoholic drinks contain calories and Alcohol stimulates appetite and leads to excess calorie intake and also Alcohol with associated starter foods (biting) further adds to calories and upsets the dietary regulation
- Drinking alcohol in high quantities regularly can cause an increase in blood pressure.
- Drinking alcohol can exacerbate neuropathy by increasing pain and numbness.

Following precautions, a diabetic person needs to take: with alcohol

- Your diabetes should be well under control. If your diabetes is already well under control, a moderate amount of alcohol may be fine either before, during, or soon after a meal.
- Avoid drinking on an empty stomach, as this will quickly increase the amount of alcohol in your bloodstream. Also drink slowly
- Also, avoid binge-drinking or sustained drinking, and never substitute alcohol for your meals. All of this can increase the risk of hypoglycemia.
- Select low caloric foods for your bitings especially Salads
- How much you should drink:
  those who choose to drink should drink sensibly and in moderation.
  a diabetic cannot drink large quantities of alcohol. he has to drink in moderation and as guided by your physician. here are drinking guidelines:
  - Three units (2 drink) for men and
  - Two units for women (1 drink): women metabolize the alcohol more slowly and are at an increased risk for alcohol-related toxicity. hence lower limits for women.
  - However, it is worth being aware of how many units a drink contains. In some cases, a glass of wine will constitute two units, and a pint of beer can even reach three units.One unit (approximate measure):
    - 1/2 pint of standard strength beer, lager or cider
    - 1 pub shot/optic/measure (50ml) of sherry or vermouth
    - 1 pub shot/optic/measure of spirit (25 ml), e.g., gin, vodka, or whisky.
- Each person will have a slightly different reaction to alcoholic drinks so it’s well worth using blood tests to check how your body responds to it.
- Energy value of hard drinks is given in this table

Sr.no.	Drink	Amount	Calories
1.	Beer	240 ml	127
2.	Brandy	30ml	77
3.	Gin	43ml	105
4.	Rum	43ml	105
5.	Whisky	43ml	105
6.	wine	100ml	105

- Low carbohydrate and low-alcohol drinks may be better than standard alcohol, but the dangers still need to be considered. Often alcohol is mixed with fizzy, sugary drinks that can impact blood sugars.

In conclusion: Alcohol may favourably impact a lot of biomarkers related to diabetes and cardiovascular diseases like HDL-C, APOA1, homeostatic function (fibrinogen), insulin sensitivity,inflammation, and others.A meta-analysis of studies with alcohol intake and insulin consumption and HbA1c in moderate drinkers revealed that insulin sensitivity was improved and HbA1Cwas lower in the group with mild-moderate alcohol consumption in many studies.Drinking moderately in accordance with the recommended guidelines, should be reasonably safe. Systemic reviews and meta-analysis reveal 30-40%risk reduction in men and women taking 1-2 drinks per day and risk gets elevated if intake is greater than recommended. Some alcohol, red wine, in particular, may even offer health benefits…However it does not mean that you should take up drinking.

12. Smoking and medications for smoking cessation:


Smoking has profound effects on diabetic patients. Macrovascular and microvascular complications are more often seen in diabetic patients with a smoking habit which in turn increases the risk of mortality.

- In smokers with diabetes, the blood pressure is often at higher levels and
- The lipid profile is altered:
  - higher plasma triglycerides,
  - lower HDL cholesterol,
  - higher plasma insulin levels, and,
- Both the above factors further increase the risk of CVD. The CVD risks often associated with smoking in diabetic patients are
  - Death,
  - Coronary heart disease,
  - Stroke and
  - Myocardial infarction.

- Patients with diabetes who smoke have higher glycated hemoglobin (HbA1c) levels and are more likely to experience severe hypoglycemia as well.Smoking increases your blood sugar levels and decreases your body's ability to use insulin, making it more difficult to control your diabetes. On the other hand, smoking cessation therapies are reported to be followed by a decrease in blood pressure. Data from observational epidemiological studies also suggest that
- Smoking is associated with a higher level of resting heart rate.
- smoking is causally associated with lower BMI and elevated blood pressure which is also considered a major risk factor for hypertension.
- **Smoking and insulin resistance:**Smoking reduces the subcutaneous absorption of insulin which results in a high dose requirement of insulin. Therefore, impaired insulin action causes increased insulin resistance. The insulin action is often affected by the direct effects of nicotine, carbon monoxide, or other chemicals in tobacco smoke.
- Smoking increases the risk of developing type 2 diabetes,and the risk persists even after 3–5 years of smoking cessation.
- The more you smoke, the greater your risk of diabetes. People who smoke heavily more than 20 cigarettes a day have almost double the risk of developing diabetes compared with people who don't smoke.
- Smoking can also make managing the disease and regulating insulin levels more difficult because high levels of nicotine can lessen the effectiveness of insulin (increases insulin resistance), causing smokers to need more insulin to regulate blood sugar levels.

Smoking cessation medication: Smoking cessation programs should be offered to the diabetic population. However, post-cessation effects need to be monitored very closely which include weight gain and depression, etc. A variety of medications are available for smoking cessation for diabetic patients. Each medication has its advantages and disadvantages, Clinicians may find combination strategies to be particularly useful as well.

Tobacco: Tobacco use can increase blood sugar levels and leads to insulin resistance. The relationship between tobacco use and insulin resistance may be confounded by multiple associated variables. For example, insulin resistance is often associated with increasedincreased BMI is a known risk factor for diabetes.

References:

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4.justin j. sherman; the impact of smoking and quitting smoking on patients with diabetes; diabetes spectrum Oct 2005, 18 (4) 202-208; doi: 10.2337/aspect.18.4.202.

13. Fast food and Diabetes

- People with diabetes need to follow a healthy diet to manage their blood sugar levels.
- Fast foods are highly processed, contain little fiber and have high salt, sugar,or fat content, and are high in calories and low in vitamins, minerals, and fiber break down quickly in the body and can cause a rapid rise in blood sugar levels. This can you're your health.
- Fast foods promote insulin resistance, which leads to diabetes, as well as weight gain.
- Some tips for eating fast food out are: don't go when overly hungry, drink water not soda, eat slowly, keep it small, fried are bad etc Food items to order:

Food items	**Say no to ….**	**Say yes to…**
Italian	Pizza, pasta	Salads, grilled chicken
Chinese	Pork over white rice, noodle dishes	Steamed foods, steamed broccoli on brown rice
American	Cheeseburger, fries, soda	Brothy vegetable, or bean soup, salads with grilled tofu, fish or chicken, lettuce-wrapped burgers, steam or roasted veggies

14. Namkeens (farsan) and diabetes

- Farsan doesn't contain a high amount of sugar but it contains high fat, which is much harmful todiabetics.Commercialfarsans have trans fats.
- Farsanchosen for eating should not contain trans fat and should be low in carbohydrates and calories. Preferably should not be deep fried
- Avoid samosa, bhujiya, kachori, deep-fried items, etc.
- Prefer farsan like khaman without oil, khandvi, steamed dhokla, poha mixed with low-calorie vegetables or curd, steamed patra, handwa, etc.

Food choices for diabetes:

Farsan	Fast food	South Indian items	Local dishes
Roasted beans	Veggie Delite	Veg Idli	Plain khaman
Roasted chana	Salad with veggies	Dosa	Dal dhokla
Roasted chiwda	Grilled chicken salad	Veg Uppam	Steamed dhokla
Baked	Subway salad	Veg uttapa	Khandvi

sev			
		Veg upma	Veg poha
			Only usal
			Punamisal
			Steamed patra

10.Cooking utensils:

- Best to cook in 304-grade stainless steel for regular use
- Can also cook in earthen pot,copper or bronze metal utensils
- Completely avoid plastic and aluminium because of the risk of different kinds of cancer with the use of this product.

Simplified diet plan for each diabetic individual:

1. **Choose food with low glycaemic index as well as low Glycaemic load: see the list** you can eat food with medium glycaemic index but with low Glycaemic load in moderation

2. **Total number of meals/days:**

   - 6 meal/day **and** Out of 6: 3 are the main meal that includes wheat pulses and/or non-vegetarian items.
   - Size of each meal: one-quarter plate that means if your aware eating daily one big plate or in India we call it thali. Dividethe dish into intoequal (imaginary) 4 parts and put your food items there and that will automatically limit your food intake.Or you use food amount as suggested by your doctor as you may be having other conditions associated with diabetes and may require an individualised and specific recommendation.
   - Examples of food intake are given in the table below

1st main meal breakfast	**2nd main meal: lunch:**	**3rd main meal dinner:**	**3 supportive meals:**
Size: 1 quarter plate Breakfast choice: ○ Quinoa 1 quarter plate or ○ Whole wheat bread 2 pc or ○ Oats 1 quarter plate or	Size: A Quarter plate Choices: ○ Whole wheat chapati ○ Dal/pulses/non-veg items ○ cooked vegetable ○ salad (raw vegetable) ○ curd (low fat) example: 1 or 2 roti as specified according to weight of person	Same as lunch or as specified by doctor	That includes small meals between two main meals Choices: ○ Salad ○ sprouts/roasted gram ○ Fruits ○ Snacks: as specified" like marie gold or other sugar-free biscuits ○ Don't eat poha/puffed rice/idlietc unless you have mixed them with major

○ Sprouts 1 quarter plate or Along with ○ Egg one to 2 as specified ○ Milk one cup ○ Fruit juice ○ Vegetable	add 1 bowl pulse cooked+1bowl curd+1bowlsalad +1bowl veg/nonveg item (2 pc chicken or 2 pc fish) 1 bowl means 200ml size bowl		portion of low calorie foods like steamed green vegetables, low caloric curd or sambhar size: one bowl=200 to 250 ml

Frequency of eating:

- You need to eat at least 5-6 times a day.
- So, between breakfast and lunch, you can eat one more small meal either fruit(F) or salad(V) or snacks(S).
- Between lunch and dinner there are gap of 4-5 hours so you need to eat at least 1-2 more small meals like fruits or salad or snacks between lunch and dinner. If dinner is early 1 small meal between lunch and dinner as specified and 1 small meal like a cup of milk can be taken at bedtime
- So basically, you need to eat at 2-3 hourly intervals to boost your metabolism and this is important.
- Drink plenty of water and avoid lying down immediately after eating.
- When you lie down try to lie on your left side to avoid acid reflux.

Always take low glycaemic index and low glycaemic load and high fiber food

Fibers are an important part of the diet. Most of the fruits and vegetables are full of fibers

Most of the whole wheat grains are full of fibers.

- There are 2 types of fibers:Insoluble and soluble
- Usually, your diet is mix of 2 types of fibers
- Usually fruits with skin are insoluble and fruits without skin are soluble fibers
- So, you have to understand both are important for our diet. Keep a mix of them

Glycaemic index or glycaemic load of afood

The glycaemic index:

The glycaemic index is a value assigned to foods based on how slowly or how quickly those foods cause increases in blood glucose levels. Foods are ranked on a scale of 0 to 100, with pure glucose (sugar) given a value of 100.Foods low on the glycaemic index (GI) scale tend to release glucose slowly and steadily. The lower a food's glycaemic index, the slower blood sugar rises after eating that food.Foods high on the glycaemic index release glucose rapidly.

- Low GI foods tend to foster weight loss,
- while foods high on the GI scale help with energy recovery after moderate to heavy exercise, or to offset hypoglycemia encountered during moderate to heavy exercises especially if of long duration like long distance running.

Long-distance runners would tend to favour foods high on the glycaemic index, while people with pre-or full-blown diabetes would need to concentrate on low GI foods. Why? People with type 1 diabetes can't produce sufficient quantities of insulin and those with type 2 diabetes are resistant to insulin. With both types of diabetes, faster glucose release from high GI foods leads to spikes in blood sugar levels. The slow and steady release of glucose in low-glycemic foods helps maintain good glucose control.In general, the more processed a food is, the higher its GI, and the more fiber or fat in a food, the lower its GI.

Glycaemic load:

But the glycaemic index tells just part of the story. What it doesn't tell you is how high your blood sugar could go when you eat the food. To understand a food's complete effect on blood sugar, you need to know both how quickly it makes glucose enter the bloodstream and how much glucose per serving it can deliver. A separate measure called the glycaemic load does both — which gives you a more accurate picture of a food's real-life impact on your blood sugar. Watermelon, for example, has a high glycaemic index (80). But a serving of watermelon has so little carbohydrate that its glycaemic load is only 5.Some nutrition experts believe that people with diabetes should pay attention to both the glycaemic index and glycaemic load to avoid sudden spikes in blood sugar. The American Diabetes Association, on the other hand, says that the total amount of carbohydrate in a food, rather than its glycaemic index or load, is a stronger predictor of what will happen to blood sugar.

How to calculate GL of a food

mostly you can find many tables that are available with both GI and GL calculated, but just for knowledge you can calculate by the following formula:

GL = GI x carbohydrate / 100

To work with this equation, you will need to know: TheGlycaemic Index (GI) of the food found by referring to a table of Glycaemic Indexes for different foods and the amount of carbohydrate in that quantity of food

Example: What is the Glycaemic load of a slice of whole-grain bread?

Glycaemic Index of whole-grain bread = 45

Carbohydrate content of a slice of bread = 18g

So, GL= 45x 18/100=8

The GI and carbohydrate values may vary slightly between different types and slice sizes of whole-grain bread.The glycaemic load can be useful for people with diabetes to assess which quantities of which foods are likely to be suitable for maintaining good blood glucose levels.The glycaemic load can involve a certain amount of calculation which may not be

practical for everyone, however, those with time to get the calculations correct may find Glycaemic load to be a helpful extra tool in choosing which foods and which portions are suitable for maintaining good blood glucose levels.Assessing the Glycaemic load of foods can be **particularly useful if you have a specific meal quite often or if you are thinking of trying a new meal but are not sure how it may impact your blood glucose levels.**

Note that different people with diabetes will have different tolerances to the carbohydrate in the food. Some people may be able to comfortably tolerate meals with a medium Glycaemic load, whereas other people may find that they can only tolerate low Glycaemic load values.

Table: Category of GI and GL

Category	Glycaemic index	Glycaemic load
High	>70	>20
Medium	56-69	11-19
Low	<55	0-10

Table: GI and GL of different foods

FOOD	Glycaemicindex (glucose = 100)	Serving size (grams)	Glycaemic load per serving
BAKERY PRODUCTS AND BREADS			
Banana cake, made with sugar	47	60	14
Banana cake, made without sugar	55	60	12
Sponge cake, plain	46	63	17
Vanilla cake made from packet mix with vanilla frosting (Betty Crocker)	42	111	24
Apple, made with sugar	44	60	13
Apple, made without sugar	48	60	9
Waffles, Aunt Jemima (Quaker Oats)	76	35	10
Bagel, white, frozen	72	70	25
Baguette, white, plain	95	30	15
Coarse barley bread, 75-80% kernels, average	34	30	7
Hamburger bun	61	30	9
Kaiser roll	73	30	12
Pumpernickel bread	56	30	7
50% cracked wheat kernel bread	58	30	12

White wheat flour bread	71	30	10
Wonder™ bread, average	73	30	10
Whole wheat bread, average	71	30	9
100% Whole Grain™ bread (Natural Ovens)	51	30	7
Pita bread, white	68	30	10
Corn tortilla	52	50	12
Wheat tortilla	30	50	8
BEVERAGES			
Coca Cola®, average	63	250 mL	16
Fanta®, orange soft drink	68	250 mL	23
Lucozade®, original (sparkling glucose drink)	95±10	250 mL	40
Apple juice, unsweetened, average	44	250 mL	30
Cranberry juice cocktail (Ocean Spray®)	68	250 mL	24
Gatorade	78	250 mL	12
Orange juice, unsweetened	50	250 mL	12
Tomato juice, canned	38	250 mL	4

FOOD	**Glycaemicindex (glucose = 100)**	**Serving size (grams)**	**Glycaemic load per serving**
BREAKFAST CEREALS AND RELATED PRODUCTS			
All-Bran™, average	55	30	12
Coco Pops™, average	77	30	20
Cornflakes™, average	93	30	23
Cream of Wheat™ (Nabisco)	66	250	17
Cream of Wheat™, Instant (Nabisco)	74	250	22
Garments™, average	75	30	16
Muesli, average	66	30	16
Oatmeal, average	55	250	13
Instant oatmeal, average	83	250	30
Puffed wheat, average	80	30	17
Raisin Bran™ (Kellogg's)	61	30	12

Special K™ (Kellogg's)	69	30	14
GRAINS			
Pearled barley, average	28	150	12
Sweet corn on the cob, average	60	150	20
Couscous, average	65	150	9
Quinoa	53	150	13
White rice, average	89	150	43
Quick-cooking white basmati	67	150	28
Brown rice, average	50	150	16
Converted, white rice (Uncle Ben's®)	38	150	14
Whole wheat kernels, average	30	50	11
Bulgur, average	48	150	12
COOKIES AND CRACKERS			
Graham crackers	74	25	14
Vanilla wafers	77	25	14
Shortbread	64	25	10
Rice cakes, average	82	25	17
Rye crisps, average	64	25	11
Soda crackers	74	25	12
DAIRY PRODUCTS AND ALTERNATIVES			
Ice cream, regular	57	50	6
Ice cream, premium	38	50	3
Milk, full fat	41	250mL	5
Milk, skim	32	250 mL	4
Reduced-fat yogurt with fruit, average	33	200	11
FOOD	**Glycaemicindex (glucose = 100)**	**Serving size (grams)**	**Glycaemic load per serving**
FRUITS			
Apple, average	39	120	6
Banana, ripe	62	120	16
Dates, dried	42	60	18
Grapefruit	25	120	3
Grapes, average	59	120	11
Orange, average	40	120	4
Peach, average	42	120	5
Peach, canned in light syrup	40	120	5

Pear, average	38	120	4
Pear, canned in pear juice	43	120	5
Prunes, pitted	29	60	10
Raisins	64	60	28
Watermelon	72	120	4
BEANS AND NUTS			
Baked beans, average	40	150	6
Blackeye peas, average	33	150	10
Black beans	30	150	7
Chickpeas, average	10	150	3
Chickpeas, canned in brine	38	150	9
Navy beans, average	31	150	9
Kidney beans, average	29	150	7
Lentils, average	29	150	5
Soybeans, average	15	150	1
Cashews, salted	27	50	3
Peanuts, average	7	50	0
PASTA and NOODLES			
Fettucini, average	32	180	15
Macaroni, average	47	180	23
Macaroni and Cheese (Kraft)	64	180	32
Spaghetti, white, boiled, average	46	180	22
Spaghetti, white, boiled 20 min, average	58	180	26
Spaghetti, wholemeal, boiled, average	42	180	17
FOOD	**Glycaemicindex (glucose = 100)**	**Serving size (grams)**	**Glycaemic load per serving**
FRUITS			
Apple, average	39	120	6
Banana, ripe	62	120	16
Dates, dried	42	60	18
Grapefruit	25	120	3
Grapes, average	59	120	11
Orange, average	40	120	4
Peach, average	42	120	5
Peach, canned in light syrup	40	120	5

Pear, average	38	120	4
Pear, canned in pear juice	43	120	5
Prunes, pitted	29	60	10
Raisins	64	60	28
Watermelon	72	120	4
BEANS AND NUTS			
Baked beans, average	40	150	6
Blackeye peas, average	33	150	10
Black beans	30	150	7
Chickpeas, average	10	150	3
Chickpeas, canned in brine	38	150	9
Navy beans, average	31	150	9
Kidney beans, average	29	150	7
Lentils, average	29	150	5
Soybeans, average	15	150	1
Cashews, salted	27	50	3
Peanuts, average	7	50	0
PASTA and NOODLES			
Fettucini, average	32	180	15
Macaroni, average	47	180	23
Macaroni and Cheese (Kraft)	64	180	32
Spaghetti, white, boiled, average	46	180	22
Spaghetti, white, boiled 20 min, average	58	180	26
Spaghetti, wholemeal, boiled, average	42	180	17

source:

"International tables of glycaemic index and glycaemic load values: 2008" by Fiona S. Atkinson, Kaye Foster-Powell, and Jennie C. Brand-Miller in the December 2008 issue of Diabetes Care, Vol. 31, number 12, pages 2281-2283. An earlier version of this table appeared here: "International tables of glycaemicindex and glycaemic load values: 2002," by Kaye Foster-Powell, Susanna H.A. Holt, and Janette C. Brand-Miller in the July 2002 *American Journal of ClinicalNutrition*, Vol. 62, pages 5–56.

Author's Note:

If that focusing on the glycaemic index and load adds a layer of complexity to choosing what to eat. So, Following the principles of low-glycemic-index eating is likely to be beneficial for people with diabetes. But reaching and staying at a healthy weight is more important for your

blood sugar and your overall health.Diabetic patients are advised to choose food low in GI and GL

Coeliac disease is an autoimmune disease can be found in young diabetics

They are advised to eat a gluten-free diet. To know gluten-free grains, let's first start with understanding what Gluten is? Gluten is the protein found in wheat, rye, oats, and barley. Thus, everything else is gluten-free. The myth that following a gluten-free diet is very hard isn't the reality. Although there is no shortage of grains that can provide healthy alternatives for a diet free of gluten, the problem lies in the cross-contamination. Most people who suffer from Celiac disease can become uncomfortable even when a small amount of gluten is eaten. This may happen despite them buying and eating 'gluten-free' foods because most places of production do not exercise the highest standards of hygiene and the chances of cross-contamination remain high. Here is the list of 7 Gluten-Free Grains:

1. Rice

Rice is the seed of grass species Oryza Sativa (Asian Rice). Rice has a large variety like brown rice, red rice, black rice, and wild rice found in various parts of the world. In a gluten-free diet, rice is a mother grain and can be used as it is or used to make flour that can be used to make rotis, cakes, and cookies. But for the diabetic individual as we all know we do not advise rice. I am just mentioning it for knowledge purposes.

2. **Sorghum or jowar**: Sorghum is a genus of plants in the grass family. In India it is called 'Jawar' or 'Jowar' and it is easily available at a local store. Jowar can be milled to make flour to make rotis and it is used as a blend in the gluten-free flour to make all baked goods.

3. **Millet**: Millets are a group of highly variable small-seeded grasses, widely grown around the world as cereal crops or grains for fodder and human food. Millet is found in three varieties –

- Pearl Millet is called Bajra,
- Finger Millet is called Ragi and
- Proso Millet is called Barri in Hindi.

Millets can be cooked in the grain form and can be milled to make excellent flour that is multipurpose from chapatis to patties, bread.

4. **Amaranth:**It is a cosmopolitan genus of annual or short-lived perennial plants. In India, the Amaranth seed is called 'Ramana'. It is very easily available and is an excellent grain that can be substituted as starch in gluten-free cooking. Replace corn-starch with powdered amaranth.

5. **Buckwheat:**Buckwheat is not a grass and is not related to 'wheat'. It is also referred to as a pseudocereal. Buckwheat in India is known as 'kuttu' and is eaten during the Navaratri festival. Buckwheat is found as groats known as "Kasha", hulled, unhulled version.

Buckwheat is used to make gluten-free beer. The ways of using buckwheat are many – from roti to pancakes, cakes, and cookies.

6. **Corn or Maize**:The six major types of corn are dent corn, flint corn, pod corn, popcorn, flour corn, and sweet corn. Maize kernels are often used in cooking as a starch. Corn is known as 'Bhutta' in India, it is easily available as fresh, dried, and can be milled to make flour. Corn is the most popular grain in the world. But as its glycaemic index is more so it is not advisable for diabetics. I am mentioning it just for knowledge.

7**. Quinoa "It** is a pseudocereal rather than a true cereal because quinoa is not a grass. Quinoa is closely related to the edible plant's beetroot, spinach, and amaranth.

Being gluten-free, the biggest challenge isn't the shortage of grains. Once you begin to see life beyond 'roti', there are many healthy alternatives available.

Obesity and Diabetes:

The benefit of small to moderate weight loss in a diabetic patient and how to achieve this??

Most of the T2DM patients are obese or overweight. Obese people often seem happy and relaxed but with this attitude, they hide body image and disappointment at being overweight. Our weight management program aims to promote the concept that although it is not easy to lose weight, you must make all efforts to lose weight if you are overweight or obese. You start your weight control through diet, exercise, and the guidance this booklet provides you. And then maybe you will see that it is not that difficult to lose weight and you will be successful in achieving your desired goal. This booklet contains many useful tips, instructions and valuable information needed to assist you in losing excess weight to protect you from future metabolic and mechanical pathologies associated with excess weight.

First of all, you need to understand few things before you start losing weight,

1. Think calmly and fully understand the significance of weight loss and make up your mind whether you want to attempt
2. Ask yourself if you would like to be overweight (no one would want that)
3. Tell yourself this time you will succeed.
4. Just think that when you have lost enough weight, then how you will feel and how life will become?? Think about the questions you will get regarding your weight loss story. People will ask how you did it?Think about how happy you and your family members would be with your weight loss.

Many people ask us the question that why some of them are overweight?

Many reasonslead to increase in our body fat than what is normal. Try And find out which of the following is causing the problem of an increase in weight for you. Here are the list of common causes that cause obesity.

1) Hereditary: This means you have received this problem from your parents. if either/both of your parents are obese ,then your weight gain has a genetic basis.

2) Eating fatty food in your diet: we eat fatty food because it's tasty and cheap and easily available.
3) physical inactivity: Modern technology and equipment have made our life inactive. Nowadays we have to take time to walk a while. Once upon a time this was the only means of movement.
4) yo-yo dieting: Are you struggling with weight loss and dieting fora long time? For some time you lose weight and then regain your lost weight. Sometime the weight gained leads to your weight exceeding the weight at which you begun your yo-yo diet? We call it yo-yo dieting. It is because of the lack of maintaining lost weight. with yo-yo dieting,It is most difficult for the body to lose weight and maintain the lost weight.
5) Stress: Unhappy and depressed person starts eating to get relief because it makes you feel better. This leads to weight gain.
6) Chronic ill nieces: some illnesses and medicines cause an increase in weight. Eg: diabetes and hypothyroidism and many medicines.

How our weight increases? How we can reduce it?

Whatever food you eat is converted into energy and that energy is used by our body for different functions. Your weight is an excellent balance between the energy you spend and the energy you consume every day.

1) if the energy generated from the food you consume is equal to the energy your body requires then the energy of your body will be balanced
2) if the energy generated from food you consume is more than the energy your body requires then this extra energy will be stored in the form of fat in your body.
3) if the energy generated from food you consume is less than the energy your body requires then for some time your already stored fat will provide energy and after that, you will start losing weight.

Yoyo dieting:

In a weight loss program, weight loss first and subsequent weight gain is commonly referred to as yo-yo dieting and this happens because people want to lose weight very fast and that exhausts their energy very fast and as a consequence, they start binge eating. This causes subsequent weight gain and a vicious circle sets in and this can be very frustrating and you end up cursing yourself for repeated weight loss failures.

Why is it important to lose weight?

People want to lose weight for many reasons.

1) you may already have a health problem like high blood pressure and want to lose weight to improve yourself.
2) people have diabetes and weight loss becomes important for them esp. if they are obese.

3) People probably lose weight to prevent health problems like heart diseases and diabetes and high blood pressure.
4) some people lose weight to look lean.

Whatever your reason may be, your doctor may have given you information to help you lose weight. Please keep in mind that your doctor discusses weight because it is an important aspect of your overall health. Your doctor's advice is a long-term challenge that is affected by behavioural emotional and physical aspects.

3 things you need to remember:

1) Obesity is the reason of many diseases e.g.
   - Arthritis
   - Gall stones
   - High BP
   - T2DM
   - CHD
   - Cancer esp. stomach and breast cancer
2) Every kg can shorten life. People with excessive weight are more at risk of heart attack than normal-weight people,
3) Increased weight makes life miserable for many. It increases the daily burden of life like on little hard work or even walks you can feel breathless and start sweating. this limits your active life. And you feel low self-esteem.

How to assess your health-related risk? How to measure your weight?

By measuring BMI and waist circumference**:** BMI and waist circumference measurements are the right way to check your weight as well as to assess your health-related risk.

BMI= body mass index is calculated to measure risk to your health in much the same way as blood pressure monitoring that evaluates risk status for cardiovascular disease or glucose level measurement for diabetes assessment

BMI=weight in kg/ (your height in meter)2

Classification of your obesity according to BMI

Table: Classification of Overweight and Obesity in Adults

classification	BMI	Health risk
Less weight	<18.5	less
Normal weight	18.5-23	medium
Increased weight	23-25	increased
overweight	>25	increased
Grade 1	25-29	serious
Grade 2	>30	Very serious

More your weight will be near to normal range, the less prone you will be to suffer from weight-related problems

How to check your body shape? and size?

Check your body fat. There are 2 types of body shape

1. Apple shape: in this type fat is deposited around your navel
2. Pear-shaped: in this type fat is deposited more around buttocks and thigh

Apple-shaped body fat deposition is more dangerous and but at the same time it is more easy to lose fat in these subset of people.

Size of your body:Waist circumference:

there is evidence that more than 90 centimeters of a woman's waist or a man's Waist above 100 cm are a dangerous aspect for health problems.

WC	Health risk
Men>94 cm Women >80cm	Increased risk
Men>102 Women>88	Very much increased risk

To measure your waist, keep the tape parallel to your abdominal just above the upper part of hip bones.

How much weight do you expect to lose?

High expectations for weight loss can be a problem. It is important to know how much weight you can lose. according to the current medical opinion, you should lose weight more slowly Losing 5 to 10 percent of your current weight is the only real and medically beneficial goal. Aim for 0.5kg weight loss every week that is equal to 500 calorie energy deficit per day. Achieve this in a very simple way. Slowly decrease the amount of food intake and at the same time increase your physical activity.

If you try to lose weight fast, often you feel exhausted and tired and hungry and for that you drink a lot of liquid substances which again leads to an increase in the weight. So, go slow. Aim for less. Make a goal to achieve 5-10% weight loss during 5-6 months. This can be achieved and also at the same time maintained easily. You will start seeing improvements after you have lost 5-10% of your weight and this will give you confidence.

Benefit of decreasing weight slowly:

- Less breathlessness and tiredness and less binge eating
- Very much beneficial for Diabetes and high BP
- Easy to maintain on long-term basis
- Gives you positive feeling
- Gives you confidence that you can achieve it

Weight loss program recommended by ICDM organization

Dietary, exercise, and lifestyle changes are fundamental aspects for any weight loss/control program. However, changing habits are not very easy and it needs a lot of motivation and

strong willingness. Besides nourishing the body, diet satisfies many of your mental needs. Eating together is an important part of enjoying life with family and friends. It is very important to determine what conditions force you to eat more. Does any of the following motivate you to eat more?

1) I eat at this time of the day even if I am not hungry.
2) I am going to watch a movie. What is fun without popcorn
3) it's a party I have to eat!
4) in a hotel: menu doesn't contain any less fat food!
5) In a function: Everyone is eating.
6) coming home is so much fun it's time to eat
7) I'm tired I should eat something
8) I am sleepy I should eat something

If you understand the factors which increase your desire to eat, then it will be easier for you to improve your eating habits. Motivate yourself to change these habits to achieve the desired weight loss.

Change your attitude towards eating pattern

1. Learn to eat right
2. There is a habit of eating with a situation. For example, eating while watching TV, eating while reading the newspaper, eating while using the computer, so try to eat at your regular mealtime,
3. learn to differentiate between the desire to eat and hunger: whenever you want to eat something, then ask yourself if your are really hungry??
4. Never eat just because it's your time to eat or you are supposed to eat now. If you are hungry then you should eat slowly.
5. Eat slowly. If you will eat fast, you will eat more food. It takes 20 min for your brain to understand that your stomach is full since you have already eaten enough before your body gives you a signal that you have eaten enough. Do not talk or drink water while your food is in your mouth.

Role of Regular physical activity in diabetes

Introduction

Regular exercise programs have proved effective in controlling the risk factors associated with macrovascular disease in nondiabetic patients and diabetic patients are also likely to derive a similar benefit from a regular exercise program. Exercise improves the condition of a diabetic patient due to several factors.

1. Improved Blood glucose control
2. Prevention of cardiovascular disease
3. Positive effect in your lipid imbalance

4. Improvement of your high Blood pressure
5. Enhancement of weight loss and maintenance of your lost weight.

Common barriers to physical inactivity: Many people do not do exercise despite advice. There are many Common barriers to exercise as listed below.

- Lack of time: could be perceived or maybe real:
- Lack of motivation
- Cost of transportation
- Accessibility to exercises areas like gym
- unsafe neighborhood
- lack off sidewalks
- Activity not culturally approved
- fear of falling among elderly
- physical ailments etc.

How to overcome these barriers?

If you understand the reasons behind your sedentary lifestyle, you can work on these points and try to overcome these barriers. For example:

I don't have time to exercise 30 minutes: break up exercise time throughout the day and started with 10 minutes daily, 3-4 times per day and try to increase the intensity of the 10 minute workout.

I am too tired after work to exercise: Do something active during the day or walk home from workplace or drop the vehicle 4-5 km before your home and walk home.

I don't feel safe in my neighborhood: form a walking group, do classes on video,in at the gym/ be active near a school or at workplace

I cannot afford a fitness center: Most people do not need a gym or fitness center to do exercises. You can do it at home also. You can choose activities that does not require equipments, use a can of food or for food or water bottle for weight/ buy some inexpensive resistance band /Walk inside a mall or at work place.

I don't have access to childcare: walk or bike with the kids. Finder finds a recreation center that offers childcare /make a daycare group, take a turn about watching the kids.

Find out What causes you to stop exercise??

- There could be perceived lack of time
- You might have stated exercise at high intensity
- Demotivation
- Exercise-related injuries

How injuries can be prevented??

we can find more overuse injuries in obese diabetics. This osteoarthritis can be a coexisting disease in a diabetic individual making joints painful and prone to injuries, a factor in

demotivating. Proper warm-up and cool-down are important in every exercise regime. You should start at low intensity in the beginning and increase gradually according to your body strength. Along with adequate rest. Make a smart goal for motivation.

If you are not able to achieve the desired goal, you should be ok with that. Achieving even less than desired is also beneficial than doing nothing. So be motivated that whatever you are doing is good for your health. Keep on doing.

Supervised exercise is required:

Many diabetic patients are sedentary and maybe at risk of complications during exercise, for eg.Some heavy unaccustomed exercise may cause a marked decrease in plasma glucose leading to hypoglycemia. When uncontrolled sugars, it may provoke hyperglycemia and ketoacidosis. Also before the exercise schedule is started, the diabetic person should be properly assessed for cardiovascular status to avoid a cardiovascular event during exercise. Individualised prescription of exercise should be given.

General recommendations for exercise in type 1 diabetes

- It was thought that exercise should not be recommended in all patients with type 1 diabetes. However, there is enough evidence now to suggest that regular physical exercise improves the risk factors for cardiovascular diseases, such as hyperlipidemia, coagulation abnormalities, hypertension, and obesity. Patients may feel an improvement in their quality of life and an enhancement of their self-esteem and a sense of well-being.
- Patients with type 1 diabetes should check their blood glucose and urine for ketones before strenuous exercise.
- In presence of blood glucose levels greater than 250 mg/dl or ketones, exercise should be avoided and a supplemental dose of insulin maybe required.
- If blood glucose levels are less than 100 mg/dl, supplemental carbohydrates should be taken before exercise.

- Preferably exercise about 1 to 3 hours after a meal.
- Those on short-acting insulin with meals, should lower the insulin dose at the meal before strenuous exercise by almost 50% of the dose.
- while those on only intermediate-acting insulin may need to lower the dose on the morning of the exercise by 30 to 40%.
- Those type 1 patients who are involved in high-intensity physical exercise with a VO2 max greater than 80% may need supplemental insulin after exercise to counter the postexercise hyperglycemia.
- Those patients on a pump will need reductions in both the basal rate and the premeal bolus, in addition to supplemental carbohydrates before exercise and at intervals during and after exercise.

General recommendations for exercise in type 2 diabetes

Regular exercise forms an important component of management along with dietary regulation and oral hypoglycaemic agents in patients with type 2 diabetes. However, every diabetic individual should follow exercise programs as recommended by their treating physician or exercise trainer along with appropriate monitoring to avoid complications.

Exercise and physical activity differ

- **Physical activity**: includes all moment that increases energy use
- **Exercise means**: plant structured type of physical activity

Basics of any exercise program:

1. Frequency of exercise: how often
2. Intensity of exercise: how hard
3. Duration of Time: for how long
4. type or mode of activity:

Activities best for diabetes are

1. Aerobic or Cardio (Isotonic exercises)
2. Resistance or weight lifting (Isometric exercises)
3. Flexibility and
4. balance

all 4 types of exercises are required for diabetic

Aerobic orisotonic exercises orCardio training

Types of aerobic exercises:

These are the exercises that work on your heart and lungs and increase your heart rate and respiratory rate. All such aerobic exercises improve the cardiorespiratory fitness and utilize a large portion of muscle mass.

Examples:

• Cycling • Walking on treadmill • Running /jogging/skipping • Swimming • Games like badminton, tennis and basketball • Zumba and other kinds of light dancing	

Recommendations: choose any exercise from above list

- Intensity:50–70% of maximum aerobic capacity
- Duration: 20–60 minutes
- Frequency: 3–5 times a week
- Do for 150 to 300 minutes per week moderate or
- 75 to 150 minutes vigorous
- While walking at any speed, wear good socks and shoes

Avoid complications:

- Warm-up and cool down
- Careful selection of exercise type and intensity
- Patient education
- Monitoring of blood glucose by patient and overall program by medical personnel

Compliance:

Make exercise enjoyable

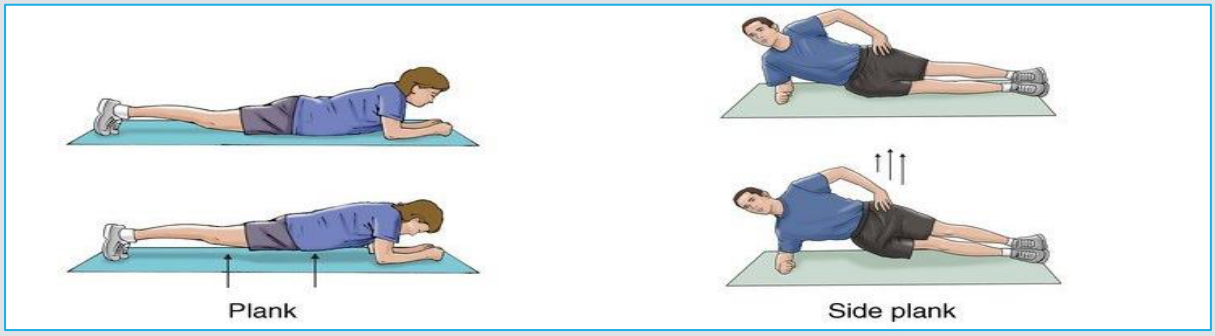
Convenient location

Resistance training or strength training or isometric exercises:

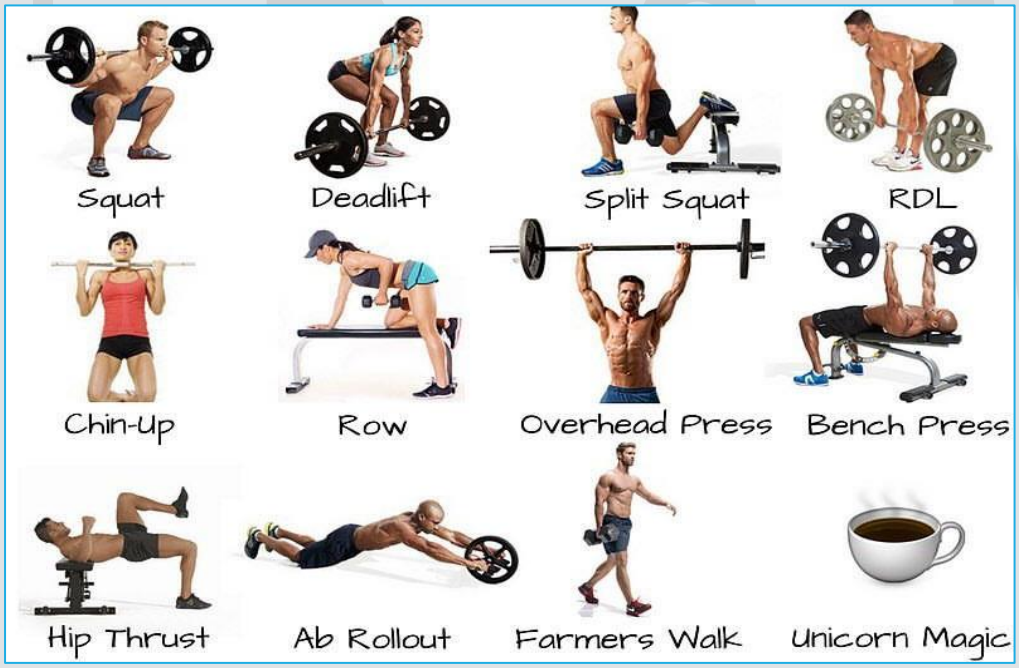
These exercises make your bones and muscle strong and healthy. With aging, we lose muscle mass and bone density. With these exercises, we build our muscle and bone mass. So,they helpin the prevention of osteoporosis.

Also helps in weight loss in an obese individual. In these exercises either you use your body as weight and work against resistance or use dumb bells as weight.You can also use different machines in the Gym or Home (multi-station gyms)

Start from using your body weight and do simple exercises then start using lesser heavier dumbbells and increase gradually. See below:



or you can start weight lifting or gym training as shown in the fig below but do these kinds of exercises under exercise instructor



Once you learn you can do it at home.

Flexibility/Core muscle exercises:

Also known as yogic exercises or yoga. As the name suggests these exercises make your body flexible and improves the joint movements, improve strength of you various muscle groups including core muscles and also prevent you from getting exercise-related injuries while doing strength training and other kindof exercises.These exercises also help in dealing with certain chronic diseases like osteoarthritis.Patients with diabetes both T1DM and T2DM demonstrated a significant fall in fasting and postprandial blood sugar values and HbA1c, with a reduction in the requirements of oral hypoglycaemic agents and insulins with yogic

practices. Along with other beneficial effects as listed above they also eliminate stress from your life.Certain asanas have been identified as useful in the control of diabetes. such as

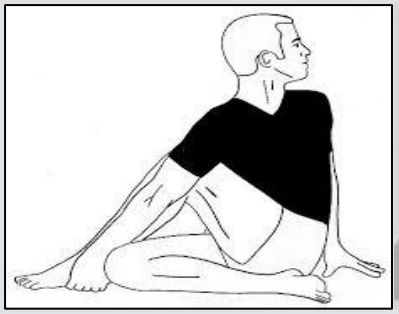
1. Dhanurasana,
2. Ardhamatsayendrasana,
3. Bhujangasana,
4. Naukasana,
5. Halasana,
6. Vajrasana and
7. Pachimotasana

have been found to have beneficial effects in terms of glycaemic control, reduction in requirements for medications, insulin kinetics, and also producing a sense of well-being.

These asanas have also been shown to increase the lean body mass and decrease the body fat content, lower rates of infections, ketoacidosis, hypoglycemia, and improvement in exercise tolerance and improved lipid profile. In comparison, physical training exercises also improve exercise tolerance and postpone anaerobic threshold but yogic practices seem to do so without increasing the oxygen consumption. Thus, yogic practices have a useful role in the control of diabetes and the prevention of long-term complications.

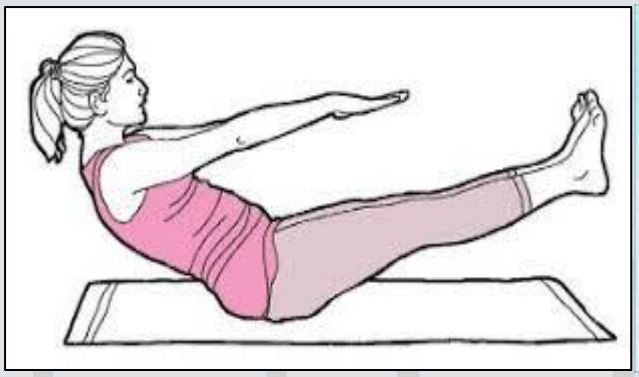
Dhanurasana: follow simply then proceed further as your body allows you.

Ardhamatsayendrasana,

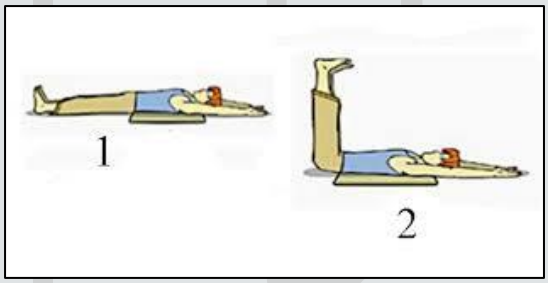


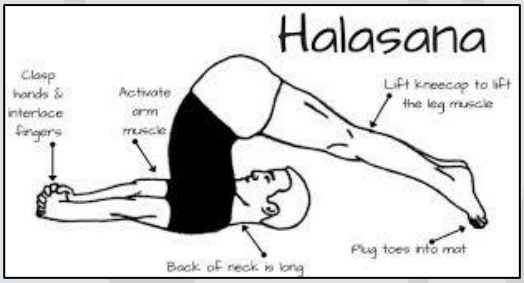

Bhujangasana:

Naukasana

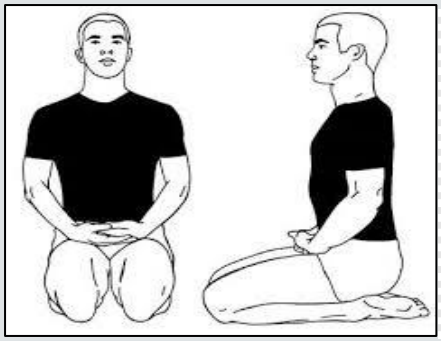


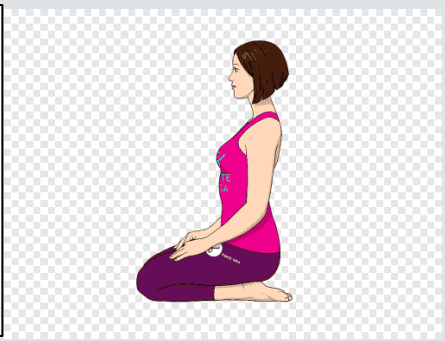
Halasana: be carefulitit is not as simple as shown in step 1 and 2**:**





Vajrasana: those who are having arthritis should not do this yogic pose.





Pachimotasana: those having slip discs do not use this pose. Or any forward bending pose


Stretching exercises:


Balancing exercises:

Helps you in balancing your body that also prevents you from falling and from the injuries because of falls.

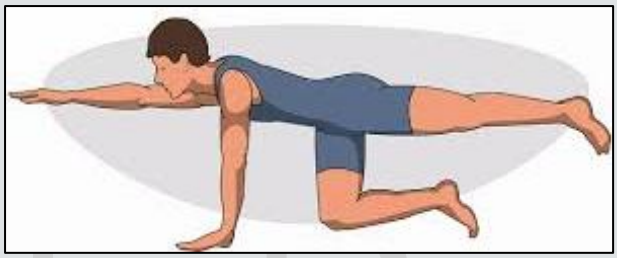
Example:

Simple balance exercises:

- One-leg stand
- Side leg raises
- Toe and heel raise
- Cushion stand
- Sitting to standing
- Changed position stands
- Backward walk

fig: Standing Dhanurasana or Natraj poseand Standing on one leg and balancing

fig: Balancing on alternate hand and leg



A diabetic individual needs to do all the exercises.Make a realistic goal. There is no hard and fast rule when you are doing exercises to make yourself physically active. Make a simple exercise regime like

- Day 1: do aerobics: you can do brisk walking for 30 min then increase to 45 min.
- Day 2: do strength trading: use 1st your body weight do upper and lower body exercises using weights starting from 1 kg and increase gradually.
- Day 3: do balancing and flexibility exercises
- And then repeat.

General guidance to Exercise program and type:

- The best form of exercise recommended to a diabetic subject is a stepwise increase in aerobic exercises.
- Plain brisk walking is the simplest and safest of all exercises. It can be started by anyone.
- Do exercise for 30 min to 60 minutes as your body allows. Increase your duration gradually to reach 60 minutes per day of moderate to heavy exercise
- Before doing any kind of exercise 1st you warm up by doing simple warm-up exercises that are nothing but simple aerobics exercises. It increases your blood circulation.
- If you are doing strength training do it under the guidance of a trainer. Once you have learnt, you can do it on your own. In the beginning, do whatever your body allows Gradually over a period of time, you can gradually increase exercise intensity and duration.
- Between 2 exercises take 30 sec to 1 min rest.
- Once you finish the exercise you should do stretching for your arms and legs .

So, everything depends on your capability. Please remember that you are not a bodybuilder,neither you are going to participate in a competition. So just relax and start doing. Doing something is better than doing nothing! For weight loss, you need to do a supervised exercise as decided by your treating doctor and physical trainer

Is activity possible with complications??

Answer: yes, but take appropriate precautions and do a supervised exercise.

Exercise recommendations for diabetic patients with complications:

Retinopathy:

- For patients who have proliferative diabetic retinopathy, strenuous activity may precipitate vitreous hemorrhages or traction retinal detachment.
- These individuals should avoid exercises that involve straining, jarring or Valsalva-like maneuvers.

Nephropathy:

- Specific exercise recommendations have not been developed for patients with nephropathy (microalbuminuria or overt nephropathy).
- Patients with overt nephropathy often have a reduced capacity for exercise. High intensity of strenuous exercises should therefore be avoided.

Peripheral neuropathy:

- Peripheral neuropathy results in loss of protective sensation in the feet.
- Significant peripheral neuropathy is an indication to limit weight-bearing exercise.
- Repetitive exercises can lead to insensitive feet leading to ulceration and fractures. Proper footwear is essential and should be advised to these patients.
- Patients should be taught to monitor for blisters and other potential damage to the feet before and after an exercise session.

The exercises recommended for patients with loss of protective foot sensation are listed in Table.

TABLE: Exercises for diabetic patients with loss of protective sensation

Recommended exercise	Contraindicated exercise
• Swimming • Bicycling • Rowing • Chair exercises • Arm exercises • Other non weight-bearing exercises	• Treadmill • Prolonged walking • Jogging • Step exercises

Autonomic neuropathy:

- The presence of autonomic neuropathy may limit an individual's exercise capacity and increase the risk of an adverse cardiovascular event during an exercise.

- Hypotension and hypertension are more likely to develop in exercising patients with autonomic neuropathy.
- These patients also have difficulties in thermoregulation and should be advised to avoid exercises in extremely hot or cold environments and to be careful about their hydration.

Isometric exercises like weight lifting and sustained handgrip are to be avoided in diabetics with complications of PAD and High BP as they increase the arterial pressure.

When do doctors recommend a stress test?

We recommend stress test for exercise training in high-risk adults e.g.

1. Smokers
2. Patient with high blood pressure
3. Patient with high blood cholesterol
4. Patient with known macrovascular disease like CAD/Stroke/MI
5. Microvascular disease like retinopathy, CKD
6. Diabetic patients aged >40-year-old
7. Diabetic patients aged >30 years with diabetes duration >10 years

Exercise in special populations

Arthritic patients: To recommend upper body exercises.

Pregnant ladies: To recommend walking and if not feasible, we recommend upper body exercises

Exercise in the elderly

Many of the elderly patients tend to avoid physical exercise. There is a progressive decline in insulin sensitivity, muscle mass, and strength as well as the loss of minerals from the bones with increasing age. Regular physical exercise can partly prevent and reverse these changes. With exercise, a better quality of life is attained in this population along with a reduction in the burden of chronic vascular disease.

The table lists the calorie consumption of various day-to-day activities.

TABLE Calorie equivalent of various activities

Self-care activities	Calorie consumption/min	Housework activities	Calorie consumption/min
Rest/supine	1	Hand sewing	1.4
Sitting	1.2	Sweeping floor	1.7
Standing/relaxed	1.4	Cleaning furniture	2.4
Eating	1.4	Washing clothes	3.0

Conversation	1.4	Scrubbing floor	3.6
Dressing/Undressing	2.3	Cooking	3.9
Washing hands/face	2.5	Ironing	4.2
Walking (4 km/hr)	3.6	Mopping	4.2
Showering	4.2	Hanging Washed clothes	4.5
Walking downstairs	5.2		

Risks of exercise

- There are several potential risks of exercise for patients with diabetes.
- In type 1 diabetes late-onset post-exercise hypoglycemia can occur 6 to 15 hours after completion of the exercise.
- In contrast, exercise may also precipitate diabetic ketoacidosis if done with uncontrolled diabetes
- Careful screening for underlying cardiac disease is important in all patients with diabetes before starting exercise.
- Exercise may aggravate several complications of diabetes and hence all patients should be screened thoroughly before initiating exercise.
- Exercise may be detrimental in the case of chronic renal failure.
- Patients with proliferative retinopathy may develop vitreous hemorrhages. Heavy weight lifting and Valsalva maneuver are particularly dangerous.

Summary and conclusion

- Feet should be inspected daily before and after exercise for cuts, blisters and infections.
- Exercise should be avoided in extreme hot and cold weather conditions and during periods of poor metabolic control.
- An exercise program for obese patients with type 2 diabetes should start slowly, build-up gradually, and include exercises that are familiar to the patient and least likely to cause injuries or worsening of long-term diabetic complications.
- Diabetic patients who exercise regularly should always carry quick-acting carbohydrates and visible diabetes identification cards to be used in the event of hypoglycemia.
- Physical exercise is, therefore, potentially beneficial for patients with diabetes mellitus, it ensures good diabetic control and promotes a sense of well-being, and protects them from long-term complications.
- Hence, it forms an important component in the management of patients with type 1 and types 2 diabetes.
- Diabetic patients would definitely benefit from structured exercise and lifestyle modification which will go a long way in controlling their diabetes on a long term basis

and keep the requirement and dosages of drugs being used for diabetes control to the minimum levels

We hope this will help you all. Best of luck!

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