

## Review Article

### **Management and Role of diet and exercise in diabetes mellitus: A Review**

**Saini K<sup>1\*</sup>, Dr. Asija R.<sup>2</sup>, Sharma P.K.<sup>3</sup>**<sup>1</sup>Student, <sup>2</sup>Principal, <sup>3</sup>Assistant Professor; Maharishi Arvind Institute of Pharmacy, Jaipur, India**\*Corresponding author**

Saini K

Email: [krishansaini7189@gmail.com](mailto:krishansaini7189@gmail.com)

---

**Abstract:** Diabetes is chronic hyperglycaemia together with other metabolic abnormalities. It is due to insulin resistance or deficiency as well as increased output of hepatic glucose. It is a risk factor for CVD. Currently there is no known cure but the disease can be controlled enabling the person to lead a healthy and productive life. The aim of management is directed at reducing complications. Many studies have shown the benefit of healthy dietary habits and regular exercise in the prevention and management of diabetes mellitus. Adherence to prescribed lifestyle changes have also been shown to improve glucose levels, and decreased blood pressure and to correct lipid abnormalities, which are factors associated with e micro and macro-vascular complications of diabetes.

**Keywords:** Hyperglycaemia, Hypoglycaemia, Food Groups, Cholesterol, Healthy Diet, Grains, Proteins, Aerobic activity, Blood glucose level.

---

#### **INTRODUCTION**

Diabetes is a common chronic disorder. There is chronic hyperglycaemia together with other metabolic abnormalities diabetes is due to insulin resistance and deficiency as well as increased hepatic glucose output. It is a risk factor for CVD[1]. Exercise is frequently prescribed for type II (non-insulin-dependent) diabetic patients, both as an adjunct to low-calorie diets for weight reduction and to improve the insulin resistance that is characteristic of this type of diabetes. Regular exercise should be encouraged as a means of acutely lowering blood glucose, improving insulin sensitivity, and increasing energy expenditure as an adjunct to diet for weight control. Regular physical exercise is now recognized to have several real and potential benefits that apply to both diabetic and nondiabetic individuals. In addition to lowering blood glucose and increasing insulin sensitivity, regular exercise improves several of the recognized risk factors for cardiovascular disease. Both low-density and very-low-density lipoprotein concentrations in serum decrease with physical training, whereas high-density lipoprotein cholesterol increases. Also, mild to moderate hypertension improves, resting pulse rate and cardiac work decrease, and physical working capacity increases with physical training. Psychological benefits of exercise, such as an increased sense of well-being, improved self-esteem, and an enhanced quality of life, may also be important for those with either type I or type II diabetes[2].

#### **Management and Role of diet in diabetes:-**

Balanced diet plays key role in the better management of diabetes. lifestyle changes can control

blood sugar. We can control blood sugar successfully if we:-

- maintain an optimal weight
- pay attention to WHAT you eat
- consider HOW MUCH you eat

Calories count is major factor in the determination of emergency in diabetes. A calorie is a unit of energy. Age, size, duration of activity decide the need of calories. Small person required less calories in compare to big person[3]. Physically active people need more calories than inactive people. Treatment can also affect metabolism. For example, a person with a thyroid gland that does not secrete enough that thyroid hormone will have a slower metabolism. People who are 20% heavier than their ideal weight are medically "obese." To reduce weight, they should eat fewer calories than their body needs[5].

#### **Food Groups**

Food is commonly divided into the following 6 food groups.

- Fat and Cholesterol
- Proteins
- Carbohydrates
- Vitamins
- Minerals
- Fibers

Too much fat and cholesterol in the blood can lead to blocked arteries in the heart and brain, as well as

other organs. Blocked arteries very often lead to heart attacks and strokes[4].

- 1 gram of fat = 9 calories. Carbohydrates and protein only have 4 calories per gram.
- Less than 30% of your total calories should come from fat.
- There are 2 types of carbohydrates- simple and complex.

Simple carbohydrates are found in candies, honey, syrup and soda. Complex carbohydrates are found in fruits, vegetables, whole-grain breads, cereals, dried beans, peas, lentils and legumes. Simple carbohydrates tend to increase blood sugar much faster than complex ones.<sup>5</sup> Complex carbohydrates satisfy a person's hunger for a longer period of time. Whole grains contain more are high fiber than others complex carbohydrates[2].

Proteins are very important for the body. Meat, poultry, fish, dry beans, eggs and nuts are rich food of protein. 1 gram of protein = 4 calories. No more than 10-20% of calories should come from protein. The body cannot make vitamins and minerals. We have to consume them without enough vitamins and minerals. Common minerals are sodium or NaCl, Potassium or KCl, Calcium and Iron[5].

Fiber is mainly found in non-animal products, such as vegetables and fruits. Fiber, also known as roughage, helps to keep bowels regular and possibly protect against colon cancer. Mostely the human body does not absorb fiber. it is not counted as consumed calories[3].

### **A Healthy Diet**

A healthy diet is a diet that provides the nutrients your body needs in sufficient amounts. Different people need different amounts of calories. Six general important guidelines that apply to all people and more importantly, to diabetics[5].

1. Single category food lacks all essential nutrients so its better to take variety of food than single category food[3].
2. Eat the amount of food your body needs. When you eat more food than your body needs, the extra calories are stored as fat. Get aware about your standard weight according to height and strictly try to reach and keep that standard weight. Eat a lot of grain products, vegetables and fruits. Dietitians recommend plant foods because they include lot of fiber, and minerals. They have no cholesterol and low fat.
3. Eat a diet low in fat and cholesterol. Less than 30% of the calories eaten by diabetics should come from fat.
4. Consume certain foods and drinks in moderation. Carbohydrates, specifically candy, desserts, sweetened drinks, salt, and alcohol, should be consumed in moderation.
5. Refrain from smoking[4].

### **My Plate**

My Plate is a guide for healthy eating that suggests eating a variety of food while eating the appropriate amount from each group of food. My plate guide is suggestion by the US department of agriculture which has 5 colours.

#### **Grains (Orange):**

Orange is colour for grain in my plate. Food made from wheat, rice, oat, etc are included in orange. Grain products are bread, pasta, chapatti etc. at least half of grains in grain product should be whole grains.

#### **Vegetables (Green):**

Green Colour denotes vegetables. It content dark green vegetables, orange vegetables, beans etc.

#### **Fruits (Red):**

Red represents fruits. Eat a variety of fruit. Make sure that half of what you eat is fruit and vegetables. Any 100% fruit juice counts as part of the fruit group.

#### **Dairy (Blue):**

Blue represents dairy. use least fat containing milk products (or fat free products).instead of milk you can choose other calcium rich product like soya milk.

#### **Proteins (Purple):**

Purple is the last category and it denotes protein. Choose low-fat contain protein diet. Your choices with fish, nuts ,beans, eggs, peas, processed soy products and seeds. Dry beans and peas are part of this group as well as the vegetable group. The amount of food eaten is measured in a unit called a "serving." Depending on the food group, the serving size may be measured in cups, grams, slices or whole fruits[5].

Serving from each food group depends mostly on age, sex, height and level of physical activity. How many servings you need from each group depends on the amount of calories you need each day. My plate reminds you to balance your portion in diet[6].

### **Management and Role of exercise in diabetes**

Daily exercise will give you more energy and help you become stronger and healthier[5]. It's easier than you think, but we know how hard it can be to get started, so we designed this booklet to help you plan an exercise program and make the right choices. One can learn

1. How to keep safe when you exercise.
2. Why activity is important for your health and for your diabetes.
3. What kind of activity and how much you need to do to stay healthy[6].

### **How to plan your exercise and get started**

#### **Effect of long duration exercise(more than 30minutes)**

1. Longer or more intense exercise can cause your

blood glucose to drop more than shorter or easier exercise. You may need to take some carbohydrate after 20-30 minutes of intense exercise.

2. Blood glucose may continue to drop for several hours after activity and should be monitored.

#### **Appropriate time of day to start exercise**

You will get healthy and fit no matter when you work out, but here are some important things to consider-

1. Morning exercise may cause your blood glucose to drop less than if you exercised later in the day.
2. If you are on insulin or taking pills that work by making more insulin, evening exercise may result in low blood glucose while you sleep[2].

#### **Have you ever had low blood glucose**

1. If your answer is yes, you are more likely to develop symptoms of low blood glucose after exercise.
2. If you exercise in the evening, you may need to take a carbohydrate snack before going to bed to prevent a low blood glucose reaction while you sleep.
3. If you are taking insulin and you exercise at night, you may need to take less at bedtime. (Check with your doctor and read the next section carefully[6].

#### **Are you “sensitive to exercise”**

If you feel that you are sensitive to exercise, your doctor or diabetes educator may suggest that you lower your pre-exercise insulin dose. If you do not adjust your insulin before you exercise, eat or drink 15 grams of carbohydrate for every 20 minutes of physical activity.

#### **Warm up and cool down**

1. Always warm up first and cool down after exercise.
2. Move slowly and stretch for 5 to 10 ten minutes.

#### **Not used to exercise**

1. Start slowly (5 to 10 minutes).
2. Build up to 3 to 5 sessions per week

#### **Check your feet**

1. Wear shoes that fit properly.
2. Always inspect your feet after activity for blisters or sores.

#### **Drink lots of water**

1. Drink water, especially in hot weather, even if you are not thirsty.
2. Have 15 to 20 ounces of water 30-60 minutes before a workout and then 12-15 ounces every 15 minutes during exercise.

#### **Other hot weather reminders**

1. Avoid exercising in hot, humid weather.

2. Exercise in early morning or late evening during summer months.
3. Wear lightweight, comfortable clothing and a hat to keep the sun off your head.

#### **A Few Exercise Alerts**

1. Have a sore throat, fever or chest cold?
2. Postpone exercise until you feel better.

#### **Have high blood glucose level and ketones**

1. Avoid exercise. (To learn about ketone testing read)
2. Use caution during exercise. Check your blood glucose 15 minutes after you start. If it goes up, stop exercising and follow your doctor's high blood glucose instructions.

#### **Is your diabetes in poor control**

Check with your doctor before you exercise.

#### **Do you have diabetes eye disease (retinopathy)**

Talk to your doctor about the kind of exercise you can do. Exercise that is done with heavy weight or weight machines can raise b.p. which can cause damage/bleeding in your eye[6].

#### **How Does Exercise Help My Diabetes and My Health?**

Whenever you move, your muscles burn blood glucose for fuel. The more you move the more glucose you burn. That means better blood glucose control for most people and better health for everyone. Exercise makes you healthier because physical activity helps you in so many ways-

1. Gives you more energy and strength.
2. Lowers your cholesterol.
3. Improves your circulation.
4. Helps manage your weight.
5. Strengthens your muscles, bones and joints.
6. Decreases your stress.
7. Improves your posture, balance and independent living.
8. Improves your well-being.
9. May help you sleep better.

#### **How Do I Choose the Best Exercise Plan for Me?**

##### **Access the level of your physical activity before choosing your best exercise plan**

- Experts agree you need either:-
- 30 minutes of “moderate intensity” aerobic activity ( cardio) 5 days a week.
- Vigorously intense aerobic activity 20 minutes or more a day, 3-5 days a week. In addition, you should add flexibility and strength training to your routine.
- Flexibility activities 5 to 7 days a week.

#### **Know How Hard You Should Work**

- Moderately intense physical activity means you are working hard enough to raise your

heart rate and break a sweat, yet still be able to talk (but not sing).

- Vigorously intense aerobic activity means you are breathing hard and fast, and your heart rate has increased quite a bit. You won't be able to say more than a few words without pausing for a breath.

### Moderate Aerobic Activities

- Walk briskly
  1. Walk 1-3/4 miles in 35 minutes (20 minutes per mile) or 2 miles in 30 minutes (15 minutes per mile).
  2. Check out the walking program on page 18 for help getting started.
- Ride a bike on level ground or with a few hills - Ride 4-6 miles in 30 minutes. (8-12 miles per hour)
- Swimming or water aerobics.
- Dancing.
- Pushing a lawn mower[4].

#### a. Vigorous Aerobic Exercises

- Jogging or running (1-1/2 miles in 15 minutes (10 min/mile).
- Riding a bike fast or up a hill.
- Basketball or tennis for 30 minutes.
- Swimming for 15-20 minutes.
- Jump rope for 15 minutes.
- Dance fast for 30 minutes.
- Aerobic classes.
- Skate for 30-40 minutes.
- Take consultancy with expert.

### Lifestyle Activities

Getting started is the important thing – any exercise is better than no activity!

1. Plan active weekends.
2. Take the stairs instead of the elevator.
3. Park at the far end of the parking lot and walk to the office or store .
4. Walk a few blocks before getting on the bus, and get off a few blocks before your stop.
5. Pace when waiting for a bus or subway.
6. Get up from your desk during the day to stretch and walk around.
7. Carry your own groceries .
8. Take a brisk walk for 10 minutes before lunch.
9. Walk your dog.
10. Trade in your electric mower for a push model, rake your leaves, or wash your car by hand .
11. Reduce your TV and computer time.
12. Get up from the sofa and stretch for a few minutes every hour[5].

### Flexibility Activities

We can do flexibility exercises in our routine workout. You can help keep your muscles and joints relaxed and mobile, so you can move easily and maintain your independence as you grow older. Flexible

exercises is important to do 5 to 7 days a week-

- Stretching Exercises.
- Yoga.
- T'ai Chi.

### Strength Activities

(Resistance Exercise)

Help build your muscles and bones, improve your posture and balance, and prevent osteoporosis by performing any of the following resistance activities 2 to 3 days a week.

- Weight lifting.
- Sit-ups and push-ups.
- Raking and carrying leaves.
- Climbing stairs.
- Wearing a backpack.
- Lifting and carrying groceries.

**NOTE:** If you have diabetic retinopathy do not lift weights before checking with your doctor[4].

### Strength Training Basics

1. Warm up before you begin with light cardio (such as walking).
2. Lift slowly (3 seconds to lift the weight and 3 seconds to lower it). Don't swing the weights to get momentum.
3. Do not hold your breath. Exhale with effort (as you perform the hardest part of the lift).
4. Maintain good posture. Keep your back straight and contract your abdominal muscles.
5. Choose 8 to 10 exercises if you are a beginner.
6. Select a weight you can lift for 10 to 15 repetitions. The weight should be heavy enough that you struggle with the final repetition but still keep good form.
7. Do 1 to 3 sets of each exercise.
8. Rest 1 minute between sets to build muscle endurance and up to 3 minutes to focus on strength.
9. If you want to get stronger increase the weight once you can easily lift 15 repetitions.

### Working out with bands and tubing

Sing rubber exercise bands or tubing makes it easy to work out at home or at the gym.

Advantages

1. They are inexpensive and versatile.
2. You can use them anywhere.
3. You can store them in a closet or drawer.
4. They come in different colors representing different tension levels.

Plan of use:

1. Start with the lightest tension and build.
2. You can begin with a set of four for a reasonable price. Purchase at least two of different intensity so you have them when you get stronger and are ready for the next level[6].

### Using Dumbbells:

**Dumbbells work too!** Start with a dumbbell you can lift 15 times. Increase to the next weight once the starting weight becomes easy.

### If you are unable to stand up to lift weight?

No problem. Do all your exercises sitting in a chair. Rubber tubing and dumbbells are both easy to use while you are sitting down. Check your library for video tapes of chair exercises[6].

Physical activity and keeping a healthy weight can help you take care of your diabetes and prevent diabetes problems. Physical activeness helpful in achievement of targeted blood sugar level. physical activity helps the insulin absorb glucose into cells[6].

Essential physical activity

- Walking and bicycling.
- do aerobic exercise.
- do strength training to build muscle.
- do stretching exercises.
- add extra activity to your daily routine.
- do yoga exercise[5].

### Risk of exercise

A number of risks of exercise for diabetic patients must also be given special attention. In type I individuals, hypoglycemia may occur during or after exercise, and when exercise is superimposed on the insulin deficient state, rapid increases in blood glucose and ketosis development may occur. Long term complications of diabetes may be worsened. Precipitation of angina pectoris, MI (myocardial infarction), arrhythmias, Individuals who have proliferative retinopathy are at increased risk for developing retinal or vitreous hemorrhages during vigorous exercise, and retinal detachment may occur.

Weight loss is the main driving force to reduce diabetes risk and also beneficial in better diabetes management. Exercise leading to weight loss consistently reduces the incidence of diabetes[6].

### CONCLUSION

No universal dietary strategy is certified for prevention of diabetes. Diabetes or delay its onset but tight adherence with right diet plan and exercise can be helpful in better management of diabetes. Dietary counseling session shows better outcomes in motivating diabetic patients to achieve better food choice as well as glycaemic lipid and weight control. Scheduled diet plan including breakfast, lunch and dinner is better helpful to achieve maintained blood glucose level than escaped breakfast diet plan. In childhood and adolescence patient psychological support is effective in blood glucose level management while in adult diabetic patient psychological intervention is not effective. Macrovascular and microvascular complications should be tackled by defined period medical checkup. Watch the

size of the portion you eat. Dietitians can be beneficial in better glycaemic, lipid and BMI control. Maintained Standard BMI can be helpful to reduce progression of micro and macro vascular complications.

### REFERENCES

1. Health Technology Assessment Section Medical Development Division Ministry of Health Malaysia, Management of diabetes mellitus. 4<sup>th</sup> edition, May 2009.
2. Horton ES; Role and management of exercise in diabetes mellitus. *Diabetes care*, 1998; 11(2):201-211.
3. Salas-Salvadó J, Martínez-González MA, Bullo M, Ros E; The role of diet in the prevention of type 2 diabetes. *Nutrition, Metabolism and Cardiovascular Diseases*, 2011;21: B32-B48.
4. Sidik SM, Ahmad R; Dietary Management of a Patient with Diabetes Mellitus: a Case Report. *Mal J Nutr*, 2003; 9(2): 137-144.
5. Richard MW, Fittante A; Exercise and diabetes. Becton Drive Franklin Lakes, New Jersey.
6. The Patient Education Institute, Inc. [www.X-Plain.com](http://www.X-Plain.com) db050105