

Nutrition for Diabetes Mellitus

UCMS Semester 8 Batch 2016

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Nutritional Management of DM

- **Diabetes mellitus** is "A group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both." (ADA, 1997)
- **Nutrition and lifestyle** play an important role in the etiology of chronic diseases like Diabetes mellitus and Obesity.
- **Medical nutrition therapy (MNT)** is a critical component of comprehensive healthcare for improving the health and quality of life of individuals suffering with various illnesses like diabetes.

Nutritional Management of DM

- **Nutritional management for DM** – a therapeutic approach to treating DM and associated symptoms through use of a specifically planned diet therapy.
- **It involves:**
 - Nutritional assessment –diet history, 24h recall, history of wt. loss, anthropometry etc.
 - Planning appropriate dietary interventions using evidence based practice guidelines.
 - Certain lifestyle modifications required.
 - Regular monitoring and follow-up.

Goals of Nutritional management for DM

- Achieve and maintain normal blood glucose levels
- Achieve and maintain optimal body weight.
 - Nutritional counseling
 - Physical activity counseling
 - Behavior modifications
- To provide relief from symptoms through diet and lifestyle modifications

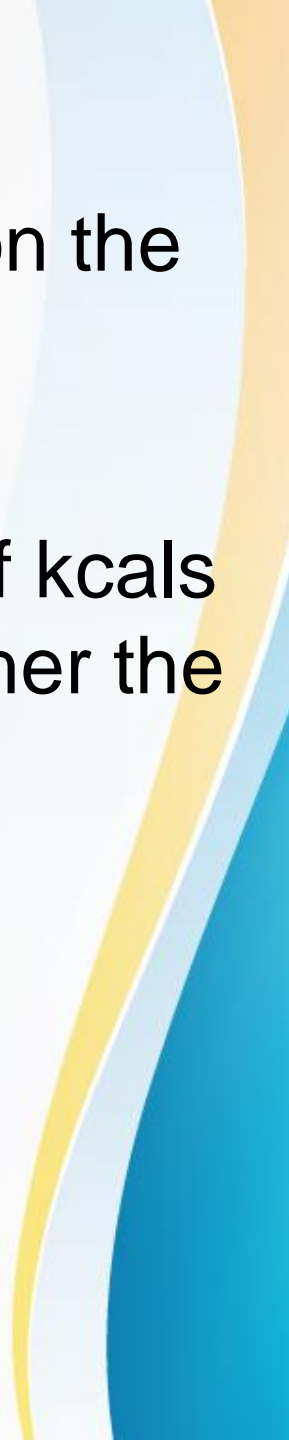
- Delay and prevent macro- and microvascular and chronic degenerative complications of DM.
- Promote and support healthy eating patterns with emphasis on reduced energy intake and portion size.
- Provide individualized optimal nutrition based on height, age, weight, sex, physical activity, nature of diabetes, cultural preferences, access to healthy foods, socioeconomic status, willingness to change and its barriers.

Nutritional management of DM

- Nutritional Therapy may be used **alone or in combination** with oral hypoglycemic drugs or insulin.
- Nutritional Therapy is integral to DM control and management and requires an **individualized approach**.
- The **diet plan** of an individual is **based on** height, weight, age, sex, physical activity and nature of diabetes.

Nutritional Management and requirements in Diabetes Mellitus

- **Determine Energy requirements:**
 - Calculate Energy value of diet and its proportionate distribution for each patient individually.
 - **For Type 1 DM:** Kcals are based on needs for normal growth, development, physical activity and maintenance of desirable body weight.
 - **For Type 2 DM:** as majority cases are obese, the Kcals adjustments are made to achieve weight loss.

- This can be done in following way:
 - Calculate the ideal body wt. (IBW) on the basis of weight and height.
 - Determine energy intake on basis of kcals for different activity levels and whether the individual is normal wt., obese or underweight.
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Built	Women	Men
Medium	Allow 100 lbs (45.5 kg) for first 5 ft (152 cms) height, plus 5 lb for each additional inch.	Allow 106 lbs (48 kgs) for first 5 ft. (152 cms) of height, plus 6 lb for each additional inch.
Small	Subtract 10%	Subtract 10%
Large	Add 10%	Add 10%

Distribution of energy in terms of carbohydrate, fat and protein:

The energy value of diet and its proportionate distribution needs to be calculated for each patient individually.

Diabetics should consume -

- 45-65% energy from carbohydrates
- 20-30% energy from fats
- 10-30% energy from proteins

Food exchange system

Function/ Food group	Major Nutrient	Food Exchange
Body building	Protein	Milk
		Meat
		Pulse
Energy giving	Carbohydrate & Fat	Cereal/starches
		Fat
		Sugar
Protective	Minerals, Vitamins & dietary fibre	Vegetables (excluding starchy vegetables)
		Fruits

Food exchange system

- **Milk exchange:** Protein content provided by 1 cup of milk (8g pr) is taken as constant for calculating this exchange.
- **Meat exchange:** The basis is 40 g of edible portion of mutton (7g pr) is taken as constant for calculating this exchange.
- **Pulse exchange:** The basis is 30 g of raw pulses (7g pr) is taken as constant for calculating this exchange.
- **Cereal exchange:** The basis is 15 g of CHO is taken as constant for calculating this exchange.

Food exchange system

- **Vegetable exchange:** The basis is 3.5 g of CHO is taken as constant for calculating this exchange.
- **Fruit exchange:** A portion of fruit that has about 10 g of CHO is taken as constant for calculating this exchange.
- **Fat exchange:** One teaspoon of fat (5g) is the basis for calculating this exchange.
- **Sugar exchange:** One teaspoon of sugar (5g) is basis for this exchange.

Carbohydrates

- Not only **amount** but **type of CHO** and its distribution are important and depends on the type of treatment being followed.
- CHO content of the diet can be estimated by use of exchange lists and CHO counting.
- **Distribution of CHOs and their type:**
 - **Carbohydrate counting:** Food portions containing 15g of CHO are taken as 1 CHO serving/ count.
 - **Type:** More of CHO to be given as **complex CHOs** than simpler ones as complex CHOs breakdown more slowly to release glucose.

Carbohydrates

- Presence of dietary fibre in complex CHO sources leads to increase in intestinal transit time, delays gastric emptying and slows glucose absorption.
- Soluble fibre lowers fasting blood sugar and glycosuria and improve sensitivity to insulin.
- Rise in post prandial blood glucose doesnot merely depend on amount of CHO ingested but also on rapidity of absorption.

Glycemic Index (GI)

- Blood glucose response to 50g CHO present in a given food as compared to that of 50g CHO in white bread, which is used as a reference food.
- Foods with a higher GI should be avoided in diets of diabetic individuals.
- **GI of any food depends on:**
 - Composition and size of starch molecules
 - smaller the size more the glycemic effect.
 - Digestibility – presence of amylopectin than amylose has greater glycemic effect.
 - Cooking methods employed also affect the GI of a particular food item.

- **Glycemic load (GL):**

It is calculated by multiplying the GI by the amount of carbohydrate in each food and adding together the values for all foods in a meal/diet.

Example, GI of certain foods < 60% include:

Apple – 39

Rajmah – 29

Curd – 36

Fenugreek (Methi) – 34

- **Artificial sweeteners** like sorbitol, mannitol and xylitol have a lower calorie content than sucrose
- Even though they are low in calorie, their consumption in amounts normally consumed would not lead to large reduction in calorie intake.
- Their consumption may cause gastric discomfort in some patients.
- Non-nutritive sweeteners approved by the FDA like aspartame and sucralose must be consumed within Acceptable daily intakes (ADI).

Protein

- Protein requirements in children and young adults is same as the normal children or young adults (1.0 g/kg body wt.)
- In patients with diabetic nephropathy – to control albuminuria, protein intake is lowered (0.6-0.8g/Kg body wt.) according to condition of the patient.
- Rich sources – milk and its pdts., legumes, whole grains, fish, chicken, egg white etc.

Fats

- Total fat intake should be lowered to 20% or less of the day's energy requirements in case of obese, adult diabetics.
- As diabetics have an increased risk of atherosclerosis, the total amount of fat must be restricted.
- PUFAs (polyunsaturated fatty acids) and MUFA (monounsaturated fatty acids) should be preferred over SFAs (saturated fatty acids)

- PUFAs sources to be included – corn, sunflower, safflower etc.
- SFAs to be avoided include – butter, ghee, vanaspati (partially hydrogenated vegetable oils)
- MUFAs sources to be included– mustard oil, rice bran oil, olive oil etc.

Vitamins and Micronutrients

- Vitamin and mineral requirements are same as healthy children or young adults.
- Fresh fruits and vegetables should be recommended as they are rich sources of vitamins and minerals.

Salt

- Intake of additional salt in meals and that in processed foods which are rich in salt should be discouraged.

Diet and Feeding pattern

- **Amount** and **time of food intake** particularly the carbohydrates, should be controlled to prevent fluctuations of blood glucose beyond the normal range.
- Intake of **refined** sugar and refined cereals should be low as blood glucose levels rise sharply shortly after consumption.
- **Avoid “Fasting” and “Feasting”** in diabetics – to avoid fluctuations – not miss a meal or overeat.

- **Small and frequent meals** with in between meal snacks should be provided according to the blood glucose levels at different meal timings – individualized approach is beneficial.
- **Adjustment** should be made for exercise and appetite.

Foods not allowed:

Glucose, sugar, jaggery, honey, sweets of different types, chocolates, candies.

Foods to be avoided:

Potatoes, yam, arbi, sweet potatoes, mangoes, grapes, bananas, alcohol, fried foods- paranthas, pooris, pakoras, namkeens, mathris, cakes, pastries etc.

Foods to be used freely:

Green leafy vegetables, tomatoes, cucumber, raddish, lemon, black coffee and tea without sugar.

Healthy eating guidelines

- Use whole grain cereals, grams and pulses.
- Avoid refined and simple CHO's like sugar, juices, jams, confectionary, sweets etc. Avoid fast foods and ready-to-eat food items that are processed and deep fried
- Cooking oil to be restricted to 3-4 ex and use more of MUFA and PUFA rich oils.
- Avoid deep fried foods and whole milk and its pdts.

Healthy eating guidelines

- Aim to include at least 4-5 portions (3 veg, 2 fruits) of fruit and vegetables each day to increase dietary fibre.
- Take more of Green leafy vegetables, whole grains, salads with every meal
- Avoid baked items, red meats, egg yolks, salted nuts, namkeens etc.
- Regulate and reduce salt and sodium intake.
- Watch for food selection while eating out.

Physical Activity and Exercise

- It increases efficiency by increasing the number of insulin receptors on muscle cells.
- Helps to reduce CVD risk factors, control weight.
- **Type1 DM:**
 - glycemic response to exercise depends on overall diabetes control, plasma glucose, and insulin levels at start of exercise. As well as type and duration of exercise.
 - Hypoglycemia may occur due to increased glucose uptake by exercising muscles.
 - Extra exchanges of CHO's depending on these factors are given according to insulin dosages to avoid hypoglycemia.

- **Type 2 DM:**

- Blood glucose levels improves due to increase in physical activity due to decreased insulin resistance, better insulin sensitivity.
- Weight reduction in case of type 2 diabetes leads to overall improvement in the condition of diabetic patient.
- CHO's may be adjusted after allowing sufficient exchanges for extra exercise/ physical activity.

A day's sample diet plan for a patient with Type-2 DM

A middle-aged shop keeper is 5'6" tall, weighs 75 kgs. He is suffering from Type-2 DM. Plan out a day's diet for him.

Age = 45 years, male with type-2 DM

Height = 5'6"

Physical activity = Sedentary

Socio-economic status = Middle income group

Food habits = non-vegetarian

- **Energy requirements:**
 - Ideal Body wt. = $106\text{lbs} + 66\text{ lb/inch} = 65\text{ kgs}$
 - referring table for estimating energy for an obese individual with sedentary activity = 1500 Kcals approx.
- **Protein requirements = 20% of 1500 Kcals**
- **Carbohydrate requirements = 60% of 1500 Kcals**
- **Fat requirements = 20% of 1500 Kcals**

- **Food exchange lists** are used to plan out the different quantities of foods that are included under different food exchange groups - cereal, pulses, meat, vegetable, fruits, fat.
- **Further these are distributed throughout the day's schedule for a meal plan:**

Meal/menu plan:

Meal	Food exchanges	No. of exchanges	Menu Plan
Early morning	Milk	0.1	Tea without sugar
Breakfast	Milk Meat Cereal	0.7 1 2	Whole wheat porridge Paneer on brown bread
Mid-morning	Fruit	1	Tea without sugar Apple
Lunch	Milk Pulses Cereal Veg A Veg B Fat (oil)	0.5 1 2 1 1 2	Chana curry Beans subzi Salad(cucumber+tomato) Ghia raita Chapati
Tea	Milk Cereal	0.2 1	salty biscuits tea

Meal	Food exchanges	No. of exchanges	Menu Plan
Dinner	Milk	1	Tinda subzi
	Meat	2	Salad (sprouts, onion, tomato)
	Pulse	1	Missi roti
	Cereal	2	Curds
	Veg A	1	Fruit custard
	Veg B	1	
	Fruit	1	
	Fat (oil)	2	

Thank you

