

## TOPIC – DIETARY MANAGEMENT DURING LIVER DISEASES

**Contents** - Aetiology, symptoms and dietary management of liver diseases, hepatitis, jaundice and cirrhosis of liver

Liver is the largest organ of the body constituting 2.5 to 3% of the body weight. It is multifunctional organ which plays an important role in carbohydrate, fat and protein metabolism. Most of the end products of digestion of food are transported directly to the liver. Compounds which it synthesizes, or stores are sent to other parts of the body when needed. Toxic substances which may enter via food or are produced in other parts of the body are detoxified here. Thus, liver has an important bearing on the nutritional status and diseases of this organ markedly affect health.

### Functions of liver:

<b>Protein Metabolism</b>	- Synthesis of plasma proteins, carrier proteins like transferrin and coagulation factors
<b>Carbohydrate Metabolism</b>	- Synthesis, storage and release of glycogen. Synthesis of heparin, Gluconeogenesis from amino acids, conversion of glucose into fatty acids, interconversion of monosaccharides
<b>Lipid Metabolism</b>	- Synthesis of lipoproteins, phospholipids and cholesterol, conversion of fatty acids, carbohydrates and protein intermediates to fat, formation of bile, conjugation of bile salts.
<b>Mineral and Vitamin Metabolism</b>	- Storage of iron, copper etc., large reservoir of vitamin A and Vitamin D, Conversion of blood coagulation factors to prothrombin in the presence of vitamin K, conversion of $\beta$ -carotene to retinol and Vitamin D to its active metabolites.
<b>Immunological</b>	- Important part of lymphoreticular system
<b>Detoxification</b>	- Of bacterial decomposition products, mineral poisons, alcohol and certain drugs like morphine and dyes.
<b>Hemopoiesis</b>	main site for erythrocyte formation in early foetal life.

### **Deficiency agents responsible for liver damage**

A fatty change in liver in kwashiorkor is attributed to low protein intake, liver is enlarged, uncontrolled diabetes and obesity can lead to fatty changes in liver.

**Infective agents-** virus can cause infections and damage to liver.

- Types A, B, C, D, E and G can cause hepatitis 10% of patients may reach chronic stage. Hepatitis B vaccination is given to prevent this.
- Yellow fever like hepatitis virus have affinity for hepatocytes. Infections like typhoid abscess and people working in dirty water can have liver diseases.

## Toxic agents-

- ❑ Alcohol- in malnourished patients consumption of alcohol produces acute liver damage and jaundice. Lipids accumulate in liver and increases in liver size.
- ❑ Drugs and chemicals- drugs like paracetamol (fever), INH(TB) and oestrogen (contraceptive) damages the liver.
- ❑ Workers in chemical industry may develop liver damage.
- ❑ Toxicity and liver damage is seen in herbal preparations.
- ❑ Excess stores of copper, iron, glycogen may accumulate in liver and can lead to cirrhosis.
- ❑ Inborn errors of metabolism- children with inborn errors of metabolism may develop liver damage.

## Damage caused to liver

**Fatty globulation-** due to disturbance in liver cells, the droplets of triglycerides are formed and function of liver are impaired. The process is reversible.

**NECROSIS-** due to excess alcohol intake the liver becomes tender and enlarged. This is due to inflammatory reaction by necrosis and death of hepatocytes due to excessive globulation or direct toxic effect.

**CIRRHOSIS OF LIVER-** cirrhosis refers to colour of nodules of hepatocytes. The normal liver cells are replaced by fibrous tissues. Hepatocytes regenerate in between the fibrous tissues.

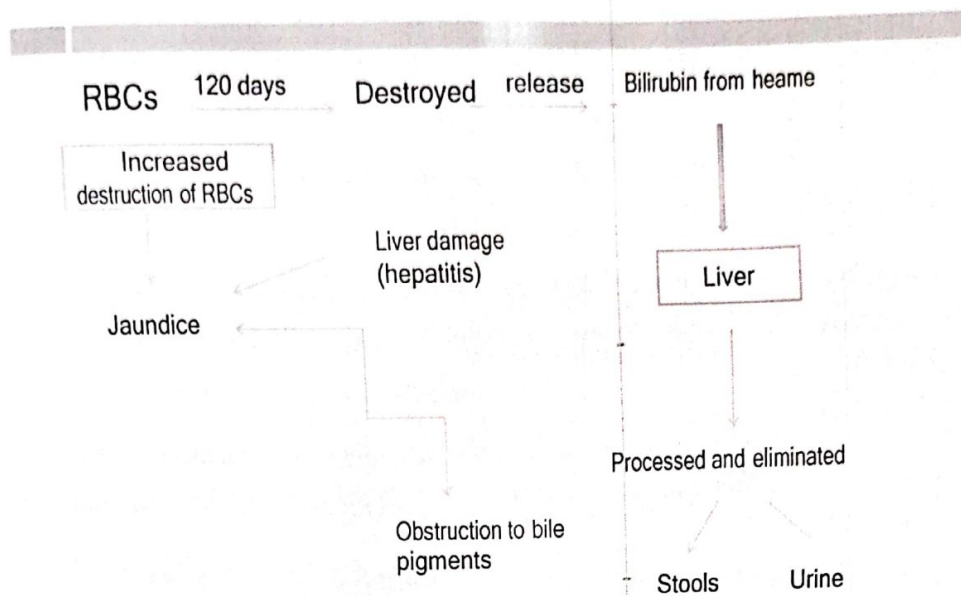
- Fibrous tissues are replaced with time and cause obstruction of portal vein and bile duct.

## Complications of cirrhosis-

- Intrahepatic obstruction causes rise in pressure in all branches of portal vein called portal hypertension.
- Enlargement of spleen.
- Varicosis which may bleed, oesophageal bleeding is common and serious complications of liver cirrhosis.
- Increased venous pressure impedes the return of tissue fluid into capillary circulates. So fluid accumulates in the peritoneal cavity called ascitis.

**JAUNDICE-** damage to liver cells leads to increased biliurubin resulting in jaundice.

- Jaundice is a term given to yellow discoloration of the skin, mucus membranes, sclera and body tissue because of accumulation of bile pigments in the blood. Jaundice is a common symptom for all liver diseases. It results due to increase levels of bilirubin in the blood. Jaundice is clinically detected when the bilirubin level is above **2.0 to 2.5 mg/dl**. (Normal level **0.2 to 0.8 mg/dl**).
- After 120 days of life RBCs are broken and bilirubin is produced. This is excreted in stool and urine along with bile. Problems like increased destruction of RBCs (hemolysis). Decreased functioning of liver (hepatitis) obstruction to the flow of bile can result in jaundice.
- Infective hepatitis- is also called viral hepatitis. Is common cause of jaundice. Hepatitis can be due to type A and E or B, C, D and G virus.



**Symptoms-** anorexia, fever, head ache, rapid weight loss, nausea and vomiting, abdominal discomfort. Colour of urine changes from dark yellow to red and faeces becomes whitish. These develop into jaundice. Symptoms continue for 4-8 weeks. Neglected viral hepatitis leads to cirrhosis of liver. Hepatitis B, C, D and G may lead to chronic hepatitis. A and E are self limiting.

#### **Dietary management-**

- High protein, high carbohydrate, moderate fat is recommended.
- Small attractive meals at regular intervals is better tolerated, overfeeding is avoided.

**Energy** – in nasogastric feeding stage about 1000 kcal are supplied. In severe 1600 to 2000 kcal are suggested.

**Proteins** – adequate proteins supply is needed severe jaundice 40g while in mild jaundice 60-80g of protein is permitted. In hepatic coma protein is not given and only CHO rich foods are given.

**Fat-** fats make food palatable and increase calorie intake.

- In severe liver failure fats are not metabolised so fat is restricted.
- Severe jaundice 20g, moderate 20-30 g of fat is recommended.

**Carbohydrates-** high carbohydrates are needed in diet to prevent tissue proteins broken down for energy purpose.

- In fever, nausea and vomiting the patient is given intravenous glucose.
- As soon as he can take oral feeds fruit juice, sugar, jaggery and honey are given which gives carbohydrates and electrolytes.

**Vitamins-** are essential to regenerate liver cells, 500 mg vitamin C, 10 mg vitamin K and B complex supplements are given. If these supplements are not tolerated by mouth vitamin injection are given.

**Minerals-** if food is not taken orally then careful watch should be kept on serum Na and K levels. Oral fruit juices, vegetable and meat sugars with added salts are given.

**Intravenous feeding-** if oral feeds are not tolerated intravenous administration of 10% glucose solution is done.

**Foods included-** cereal porridge, soft chapattis, bread, rice, skim milk, tapioca, potato, yam, fruit juices sugar, jaggery, honey, biscuits and soft custard.

**Foods avoided-** pulse, beans, meat, fish, chicken, egg, sweet preparations with ghee, bakery products, dried fruits, nuts, spices, papads, whole milk, cream, alcoholic beverages. Small and frequent meals and enough fluids are recommended.

**Cirrhosis-** is condition in which there is destruction of liver cells due to necrosis, infiltration, fibrosis and nodular regeneration. It is serious irreversible disease. Cirrhosis may commence many years before it becomes clinically obvious.

#### **Aetiology – cause**

- 1) Viral infection- hepatitis virus B, C, D and G are more likely to produce cirrhosis.
- 2) Alcohol- it is estimated that 60g alcohol for men, 20g for women over prolonged periods increases risk of cirrhosis.
  - Alcohol makes liver susceptible to infections and toxins. (Band C hepatitis and drug toxicity)
  - It increases fatty acid synthesis.

**Nutrition-** malnutrition aggravates injury to liver vitamin A,  $\beta$  carotene, vitamin E and C.

**Toxins in food-** Aflatoxin, chillies and spices can damage liver, haemochromatosis (no control on iron synthesis) and Wilson's disease (disturbance of copper metabolism) can lead to liver cirrhosis.

**Symptoms-** onset of cirrhosis is gradual with,

**GIT symptoms-** anorexia, nausea, vomiting, pain and distension!

- Weakness, muscle cramps, weight loss and fever and later jaundice.

Other serious complications are

**Ascitis-** accumulation of water, abnormal amounts of fluid in abdomen. Due to portal hypertension, impaired albumin synthesis increased Na retention or impaired water excretion.

- Oesophageal varicose- varicose veins in oesophagus or upper part of stomach; due to portal HTN and haemorrhage results if high fiber diet is eaten.
- There may be accumulation of  $\text{NH}_3$  and subsequent hepatic coma.

## Principle of diet-

A high calorie, high protein, high carbohydrate, moderate or restricted fat, high vitamin diet and minerals should be given. Sodium is restricted if ascites is present. Fiber is restricted when there is esophageal varicose and HTN.

**Energy** – high calorie diet is necessary due to prolonged under nutrition. Calorie requirement is 2000-2500 kcal.

**Protein**- serum albumin is synthesized by liver cells, is low in cirrhosis. A high protein diet is useful for regeneration of the liver. 1.2gm/kg of body weight is given. Addition of casein to milk, soups and ice creams. Vegetable proteins are very useful.

**Fat**- About 20gms of fat is given. Medium Chain Triglycerides containing C10 fatty acids are given; coconut oil contains medium chain fatty acids.

**Carbohydrate**- CHO are supplied liberally as it is needed to replenish glycogen stores. 60% of the calories should come from carbohydrate.

**Vitamins and minerals**- liver is the major storage of vitamins and minerals. Vitamin B complex is supplemented. Sodium is restricted in oedema and ascites. In all patients with ascites Na intake is restricted to 400-800 mg/day. Restriction of water to 800-1000 ml/day for hyponatremia.

- Anemia is common, so iron supplementation is given (FeSO<sub>4</sub> tablets 0.3g 3 times daily). Folic acid 1 mg/day is indicated in macrocytic anemia.
- Patient is kept on enteral feeding if oral feeding is not possible. If enteral feeding is unsuccessful the parenteral feeding is given.

## TOPIC - DIETARY MANAGEMENT DURING CARDIOVASCULAR DISEASES

**Contents** - Aetiology, symptoms and diagnosis, types and dietary management of cardiovascular diseases  
Atherosclerosis and hypertension

A heart disease affects people of all ages but is more frequent in middle age & caused by atherosclerosis. The diseases of heart may affect the pericardium, myocardium, & endocardium. In addition, the blood vessels within the heart, leaving the heart or heart valves may be affected.

- ↓ **Atherosclerosis**- The valves of small arteries become thickened due to aging or hypertension. In the word atherosclerosis, athero means gruel, sclerosis means hardening.
- ↓ **Coronary artery disease**- It is precipitated by obstruction of coronary arteries which nourish the heart muscles. It can manifest angina & heart attack.
- ↓ **Angina**- Narrowing of coronary arteries results in insufficient blood supply (ischemia) causing severe pain across the chest. This kind of pain subsides after sometime but this is the first sign of trouble. This pain is called cry of hungry heart.
- ↓ **Hypertension**- Persistent elevation of blood pressure it impairs the pumping function of heart & if indicated damages heart, brain & kidneys
- ↓ **Stroke**- Stroke results from block in the vessels supplying blood to brain or when the artery ruptures leads to cerebral hemorrhage. A stroke occurs more often in patients with high B.P. It can lead to paralysis, speech, vision defects, mental deterioration, memory lapses, fainting spells
- ↓ **Peripheral artery disease**- Occurs when blood vessels supplying blood to limbs are blocked. Reduced blood supply may result in irreversible damage & death of tissue (gangrene) it occurs in blood vessels of legs is common.

### **Risk factors for heart disease**

#### **Statifications or non- modifiable factors-**

- **AGE**- The incidence of heart disease increases in the middle age around 50-55years
- **GENDER**- Coronary artery disease is twice as high in men than women. After menopause it is similar in men & women.
- **FAMILY HISTORY** - Those with family history of disease are more prone to disease. If it is present in both the mother and father the offspring are more likely to get it.
- Asians and Indians are more prone to the disease.

#### **Risk factors that can lower the CVD risk**

- **Cigarette smoking**- cigarette smoking enhances the endothelial damage, heart rate and B.P. lowers the good cholesterol, promotes thrombus formation. There is reduction in CVD risk in those who quit smoking
- **High saturated fat, increased cholesterol diet**- High intake of saturated fatty acids increases plasma cholesterol so promotes the formation of atheroma. Saturated fat increases the thrombus

formation. Animal fat like egg yolk, butter, meat fat have high saturated fat and cholesterol. Margarine, ghee, hydrogenated fat and coconut oil have high saturated fat.

- **Elevated low density lipoprotein cholesterol-** High LDL cholesterol is associated with the development of atherosclerosis
- **Hypertension-** Hypertension is an independent risk factor for CHD & stroke. Reducing B.P can lower incidence of stroke, CHD and heart failure.
- **Left ventricle hypertrophy-** It is the condition that develops due to chronic pressure i.e. high B.P
- **Thrombogenic factors-** High fibrinogen levels leads to coronary heart disease.
- **Other dynamic factors-** Diet, obesity, diabetes, sedentary habits and stress.

### **ATHEROSCLEROSIS**

Is the process by which arteries narrow due to deposition of gruel like substances made up of lipids and blood cells. It is a vessel clogging disorder which is dominant for some time and manifests age advances.

- It occurs in large arteries, aorta, coronary arteries, arteries of brain, lower limbs and kidneys. The walls of arteries become roughened in atherosclerosis which narrows the passage; the blood cells adhere to roughened walls and forms blood clots (thrombus). The clot reduces the blood supply to tissue\ organs (ischemia)

#### **Dietary management for atherosclerosis-**

##### **Objectives-**

- 1) Maximum rest to the heart
- 2) Maintain good nutrition
- 3) Acceptability of the program

**Principles of diet-** Low calorie, low fat. Particularly low saturated fat, low cholesterol, high in PUFA, n6 to n3 ratio of 4-10 : 1 & normal protein, minerals, vitamins are suggested. High fiber diet is recommended.

**Fat-** The fats should form 20% of total calories consumed. The proportion of saturated to monounsaturated to PUFA ratios of fat have to be 5:6:4.

Fish are good sources of n3 fatty acids. Consumption of 100-200g of fish 2-3 times a week helps preventing heart disease.

Daily consumption of 10-15g of fish oil everyday can represent 3-5g of n3 fatty acid adequate to control hypertriglyceridemia.

**Cholesterol-** Levels in diet should not exceed 300mg. vegetarian foods have no cholesterol they are low in fat & calories.

- Mustard oil and soya oil are rich in n3 fatty acids, alpha linolenic acid.
- Safflower and corn oil are rich in (n6) linolenic acid.
- Blends of these oils are considered good..
- Sunflower oil: Palmolein oil- 1:1
- Safflower: Groundnut oil- 1:3
- Sunflower: Groundnut oil 1:3

**Carbohydrates** - The total sugar content of diet is decreased. The calories from the complex CHO should form 55-65% of total energy.

**Proteins**- The proteins should form 15-20% of total energy intake for atherosclerosis. Animal proteins are restricted since they are rich in cholesterol & saturated fats, animal fats, organ meats, eggs are restricted.

**Sodium** - Is restricted whenever there is hypertension. The total salt intake should be less than 1 tea spoon i.e. 5g totally. Sodium restricted of severe kind is not done for all the patients but ordered individually as the condition of patients requires. WHO recommends 6g of salt from all food sources.

**Low glycemic index food**- Studies have shown that low G.I foods have positive effect on reducing the coronary heart disease.

**Fiber**- High fiber diet is useful for atherosclerosis & reduces cholesterol. Apples & Guava rich in pectin lowers the serum cholesterol & enhances excretion of fecal sterols. Legumes, vegetables, & fruits lower the serum cholesterol. So whole grain cereals are used.

#### Dietary Guidelines-

- Patient should maintain slightly lower weight than standard weight.
- Diet should be rich in fiber by including raw vegetables, salads, fruits, GLVs & whole grains.
- 5 servings of fruits & vegetables should be included. Since they are rich in anti oxidants.
- Fish in the diet is beneficial as it contains omega 3 fatty acids.
- Concentrated foods like sweets, chocolates, cakes, pastry, ice creams & fried foods should be restricted,
- Soft drinks, alcohol, sugar & sago are avoided.
- Egg yolks are rich in cholesterol. Eggs should be restricted to 2-3/week
- Coconuts should be restricted.
- Coffee & tea to be taken in moderate amount. Excess caffeine increases the heart rate.
- Animal fats like meat & pork contain saturated fat so it should be restricted.
- Shrimp and crabs have less amount of fat & may be included.
- Hypertensives should reduce the fish since they contain more sodium.
- Soya bean, fenugreek, garlic, onion and turmeric are hypocholesterolemic and have to be included in diet.
- Small & frequent meals are included.

### HYPERTENSION

Hypertension is fast becoming a common health problem in India, likely because people are adopting increasingly sedentary lifestyles and poor eating habits. It is important to note that men/women, young/old adults all are at risk of this problem and it is a major risk factor for coronary heart disease, heart failure, renal disease and other complications. What is alarming is the fact that hypertension is known as a silent killer. It often occurs without any symptom or warning signs until more serious problem arises. Modifying lifestyle factors is important for managing hypertension.

Hypertension is a health condition characterized by high blood pressure. Blood pressure (BP) is the force of circulating blood against the inner walls of blood vessels. When blood travels through the blood vessels with more force than is considered healthy it is called hypertension. An instrument/device called sphygmomanometer is used to measure BP.



An optimum blood pressure level is a reading under 120/80mm Hg. The numerator 120 represents the pressure when the heart contracts and is referred to as "Systolic pressure". The systolic measurement is the peak pressure in the arteries. The denominator 80 represents the pressure when the heart relaxes (is at rest) between beats, called the "Diastolic pressure". Diastolic pressure is the minimum pressure in the arteries.

Blood Pressure Category	Systolic blood pressure (SBP)	Diastolic blood pressure (DBP)
Normal	<120 mm Hg	<80 mm Hg
Elevated	120–129 mm Hg	<80 mm Hg
<b>Hypertension</b>		
Stage 1	130–139 mm Hg	80–89 mm Hg
Stage 2	≥140 mm Hg	≥90 mm Hg
Hypertensive Crisis	≥180 mm Hg	≥120 mm Hg

WHO defines hypertension as condition in which systolic pressure exceeds 160mm and diastolic pressure exceeds 95mmHg.

- High BP is not a disease; it is a symptom indicating some underlying disease in progress.
- High BP is cause for 1 in 8. Death worldwide making hypertension the 3<sup>rd</sup> leading killer in world.
- Hypertension impairs the pumping function of the heart and if untreated damage the hear, brain and kidneys. A stroke occurs more often in patients with high BP.

### CAUSES-

CVD, renal disease like glomerulo nephritis, polycystic renal disease, pyelonephritis, tumors of brain or adrenal glands, hyperthyroidism or disease of ovaries and pituitary glands may cause hypertension.

Predisposing factors are heredity, stress, obesity, smoking, high viscosity of blood due to too many RBCs in circulating blood, narrowing of blood vessels due to hormones, cortisone, aldosterone, adrenaline and nor adrenaline.

### CLASSIFICATION OF HYPERTENSION-

- 1) **MILD HYPERTENSION-** diastolic BP is 90-104mmHg. Treatment is based on weight loss, sodium restriction and behavioural techniques.
- 2) **MODERATE HYPERTENSION-** Diastolic BP is between 105-119mmHg with moderate hypertension nutrition therapy is accompanied by drugs such as B Blockers.
- 3) **SEVERE HYPERTENSION-** Diastolic pressure is 120-130mmHg and above. The treatment for moderate hypertension peripheral vasodilatation is given.

## SYMPTOMS-

Many persons do not have any symptoms. Head ache dizziness, impaired vision, failing memory, shortness of breath, pain over the heart, GIT disturbances, unexplained tiredness are some of the symptoms.

## PRINCIPLES OF DIET

Low calorie, low fat, low sodium diet with normal protein is prescribed.

### Dietary management-

Earlier kempners diet was suggested for hypertension. It is rice and fruit diet. Diet is deficient in many nutrients.

**Energy** -about 20 kcal/kg of ideal body weight is prescribed for sedentary worker and 25kcal/kg body weight for moderately active worker. Alcohol consumption is reduced.

**Protein** -In severe hypertension proteins are restricted to 20g/day.

**Fats** - as they are prone to atherosclerosis about 20g of fat is advised. High intake of hydrogenated fat and animal fat is avoided as they are prone to atherosclerosis.

**CHO**- complex CHO are useful for management of hypertension.

**Sodium**- increased Na in diet leads to increased intravascular volume and increases cardiac output elevating blood pressure.

Moderate Na restrictions of 2-3g/day reduces the diastolic BP by 6-10mmHG. Na restriction with weight reduction can control mild or moderate BP of arteries.

**Potassium**- low levels of K causes the body to retain more Na and water and elevate the BP. Lowest risk of high BP is high K and low sodium groups. 350mg of K is needed daily and fruit and vegetable intake liberally meets K requirements.

**Calcium**- high calcium decreases the high BP

## DO NOT USE

- Salt in cooking or at table
- Monosodium glutamate (ajinomotto) baking powder, sodium bicarbonate and sodium benzoate
- Pickles, canned foods, potato chips
- Ketchup, sauces, frozen peas
- Shell fish, dry fish
- Biscuits, cakes, pastries
- Salted butter, cheese

## **MODIFICATION OF LIFE STYLE-**

- Weight reduction- maintain normal weight
- Adopt (DASH) dietary approach to stop hypertension- consume diet rich in fruits and vegetables and low fat, dairy products and reduces saturated and total fat.
- Dietary sodium reduction- no more than 6g NaCl/day
- Physical activity- regular aerobics physical activity brisk walking of 30mins/day
- Alcohol consumption- not more than 2 drinks per day

## **DASH DIET-**

**DASH** (Dietary Approaches to Stopping Hypertension) dietary pattern. The DASH diet consists mainly of fruits, vegetables and low-fat dairy products and includes whole grains, poultry, fish and nuts while limiting the amount of red meat, sweets and sugar-containing beverages

- high amounts of fruits and vegetables 4-5 servings
- inclusion of fish
- inclusion of low fat milk 2-3 servings
- reducing fat intake
- reducing sodium levels
- lean meat- 2-3 servings
- gravies- 7-8 servings.

## TOPIC – DIETARY MANAGEMENT DURING DIABETES MELLITUS

**Covered** - Aetiology, symptoms, types, diagnosis and dietary management of diabetes mellitus, glycemic index, low GI foods

Diabetes Mellitus (DM) is a condition, when the blood glucose or so called "blood sugar" is too high. Diabetes is a disease that affects body's ability to produce or respond to insulin. Insulin, is a hormone that is released in response to food we eat. In a normal healthy person, the pancreas release insulin to help the body store and use the sugar from the food they eat. Foods, particularly carbohydrate-rich foods in our diet namely, rice, wheat, potatoes etc. are digested and broken down into a sugar called glucose. Glucose is vital for our health because it is an important source of energy for our body. Insulin helps to utilize this glucose to produce energy by the body for our daily activities. Insulin also stimulates the cells to take up glucose, thus prevents a rise in blood glucose and maintains its level within certain normal limits

- It is known as disease related to sweetness since centuries, India will become one of the countries with highest number of diabetes (50 million)
- Insulin is the hormone produced by the  $\beta$  cells of pancreas. It helps for uptake of glucose by the cells and maintains the blood glucose levels within normal limits.

In diabetes,

- 1) Pancreas cannot produce enough insulin
- 2) Insulin produced is not effective in controlling the blood sugar.

### Types of diabetes

**Type I-** Insulin dependent diabetes mellitus(1DDM) seen in adolescents and children, onset is very rapid. There is little or no insulin production. Symptoms are severe if insulin injections are not given patient develops ketoacidosis and diets.

**Type II-** Non insulin dependent diabetes mellitus(N1DDM) affects the adults who are overweight, obese, insulin production is normal or high but insulin produced is not effective. The onset is gradual. The diet, exercise and anti diabetic drugs are enough to control the blood sugar.

**Gestational diabetes:** diabetes developed during pregnancy is called gestational diabetes. Pregnant women should be checked for diabetes if there is a family history of diabetes.

**IGT- impaired glucose tolerance** – when rise of blood sugar after 75g glucose load is between normal and diabetic patients condition is called impaired glucose tolerance. Such persons should be careful in diet and avoid obesity and do regular exercises.

### **Risk factors :**

1. Heredity – N1DDM runs in families.
2. Obesity
3. Sedentary life- people who eat too much and lead sedentary life, insulin sensitivity goes down
4. Aging is also considered as a risk factors

**Prevalence:** higher in affluent societies and obese persons 2-4% in rural areas, higher in urban areas.

**Symptoms** – many times the diabetes is asymptomatic, it is called silent killer. It is detected after blood check up

1. Excess thirst (Polydipsia)
2. Increased appetite (Polyphagia)
3. Frequent urination (Polyuria)
4. Loss of weight
5. Easy tiredness
6. Slow healing of cuts and wounds.

**Diagnosis:** Fasting blood sugar, is more than 128mg/dl and 2 hours after glucose loading of 75g it is 180mg/dl. The diabetes is confirmed by oral glucose tolerance test (OGTT).

**OGTT** – test is conducted after 12 hours of overnight fast. Glucose 75g in adults and 1.75g/kg of body weight in children is orally administered. Before glucose load and 2 hours after it, blood samples are collected and glucose levels are estimated.

**Plasma Glucose Level (mg/dl)**

	<b>Fasting</b>	<b>Post prandial (PP) 2-hr post meal</b>
Normal	<110	<140
Diabetes	>126	≥200

## **Classification of diabetes**

### **I) Type I diabetes-**

1. Immune mediated diabetes. Previously called IDDM, auto immune destruction of  $\beta$  cells occurs, seen in adolescent and childhood.
2. Idiopathic diabetes- this form is strongly inherited but no evidence of auto immunity.

**II) Type II diabetes-** It is adult onset diabetes. Insulin resistance and relative insulin deficiency. Do not need insulin for survival.

- A. Genetic defects of  $\beta$  cells – maturity onset diabetes of young (MODY) it is associated with monogenic defect in  $\beta$  cells.
- B. Genetic defect in insulin action
- C. Disease of exocrine pancreas –Pancreatitis, Trauma/pancreatotomy, Neoplastic(tumour), cystic fibrosis, hemochromatosis, fibrocalculus pancreatopathy (FCPB)
- D. Endocrinopathies- excess of growth hormone, cortisol, glucagon and epinephrine can cause diabetes.
- E. Drug or chemical induced diabetes
- F. Infections- virus congenital are associated with destruction
- G. Uncommon forms of immune mediated diabetes
  - i. Stiff man syndrome
  - ii. Anti insulin receptor antibodies.

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**III) Gestational diabetes mellitus-** any degree of glucose intolerance with onset of 1<sup>st</sup> recognition during pregnancy is called GDM.

**IGT-** impaired glucose tolerance when glycemic response after administration of 75g of oral glucose is intermediate between normal and diabetic condition is called IGT. Fasting blood glucose more than 110 and more than 126 hour after 75g glucose load more than 140 and less than 200.

**Urinary sugar** – urinary sugar is tested using Benedict's test or commercially available diagnostic strips (unistix)

**Benedict's test-** 8 drops of urine + 5ml Benedict's solution are taken and kept for boiling in a water bath for 5 minute. Second urine sample is taken in the morning that will reflect urine sugar level. Self monitoring of urine samples will provide valuable information to patient and doctor to fix the dose of drugs.

## COMPLICATIONS OF DIABETES

### Acute complications-

1) **Hypoglycaemia-** Rapid and severe lowering of blood sugar (below 40-50mg/dl) is called hypoglycaemia. The person with low blood sugar experiences increased appetite, weakness, sweating, restlessness, palpitation (rapid beating of heart) and giddiness. This can result from excessive dose of insulin and inadequate intake of food or due to intake of alcohol along with antidiabetic drugs or following strenuous exercise.

2) **Ketoacidosis-** when body cannot utilize carbohydrates to provide energy it burns increased amounts of fats and certain amino acids and results increase of metabolic products called ketosis. When ketones produced are more it accumulates in the body resulting in ketoacidosis. In this serious condition the patient may go into coma. Before going into coma he may experience thirst, weakness, drowsiness with or without vomiting. It may result from inadequate treatment of diabetes during acute infection.

3) **Infection** – in diabetic cuts and wounds heal slowly. The patients are prone to T.B, infections of skin, urinary tract and foot.

### Long term complications-

1) Increased predispositions to atherosclerosis- (hardening of blood vessels due to deposition of fatty substance) due to high levels of blood lipids, cholesterol and triglycerides makes them susceptible to heart diseases and shock.

Serum cholesterol levels: Increased cholesterol levels is a risk for heart disease. Desirable levels less than 200mg/dl, Borderline high- 200-239, high more than 240.

2) Lesions that affect- small blood vessels of eyes and kidneys, retinopathy and nephropathy results in excretion of protein in urine and neglect may lead to kidney failure, diabetes can develop. Neuropathy due to peripheral lesions of nervous system leads to numbness and burning sensation in distal parts of upper and lower limbs and tingling and numbness.

## Objectives of diabetes management:

- 1) Reduce the blood sugar level
- 2) Maintain ideal body weight
- 3) Treat the symptoms
- 4) Reduce serum lipids
- 5) Provide adequate nutrition
- 6) Avoid acute complications
- 7) Prevent vascular complication

**Treatment-** diet, exercise, drugs, education

**Diet in diabetes-** Normal Indian diet is suitable for diabetic but nutrient intake has to be tailor made based on age, sex, height, weight, physical and physiological needs of patients.

**Diet prescription-** is made based on day to day activity, diet history, based on physical activity, body weight and the total calorie requirement is calculated.

Calories - energy should allow patient to loose or gain weight and maintain 105 lower then ideal body weight.

**Ideal body weight- calculated by using the formula**

**IBW = Height in cm - 100**

Based on body weight- for obese (20% above ideal weight) or under weight (20% below ideal body weight) based on these the daily calorie requirement of individual /kg body weight can be worked weight

For over weight 20 kcal/kg body weight/day, for ideal body weight- 30kcal/kg

For under weight- 40kcal/ kg body weight/day

Generally the calorie recommended for diabetes than normal.

**Pregnant women-** pregnant women with diabetes are more prone to certain illness than non diabetic pregnant women. Insulin requirement of pregnant women goes up by 1-3 times. In absence of insulin the ketoacidosis results. Pregnant women with diabetes are more prone to:

- Pre-eclampsia (condition characterised by albuminuria, hypertension and oedema in pregnancy)
- Toxaemia (poisoning of body by products of bacteria or damaged tissue)
- Hydroaminosis (excess water in amniotic fluid)
- Increased risk of abortions, congenital malformations.

Blood sugar should be controlled by dietary treatment and treatment with insulin. Delivery should be conducted under medical supervision. Neonatal hypoglycemia and respiratory distress is common in new born of diabetic mothers. Children are typically heavy and need special attention.

Pregnancy requirements- 30 - 35 kcal/kg of desirable weight.

Proteins- 1.5-2.5g/kg body weight

Children- 1000kcal+125 cal for boys

1000kcal+100 cal for girls for every year of age

For 10 years boys and girls 1000+1250=2250

### For diabetic persons adults

**CHO-** Diabetics have to alter the type of CHO in diet 60-65% of calories should come from CHO. Cereals and pulses should be included. Refined CHO like honey, jaggery, sugar and jam are avoided. Sugars present in fruits and milk raise blood sugar at slow rate.

Distribution of CHO- Blood sugar levels depends on intake of CHO. Total CHO are divided into 4-5 parts 1/3(33%) is served during lunch and dinner. Out of remaining 1/3(25%) during break fast and 9% during tea or bed time.

In insulin dependent patient- Additional CHO are given before patient goes to sleep to prevent hypoglycemia, if patient is on slow acting insulin.

**Proteins-** are essential for growth and tissue repair, RDA is 1g/kg body weight. Children, pregnant and lactating mothers need more. The requirement of protein increases during burns and trauma. In diabetes associated with renal problems, protein is restricted to 0.6/kg body weight. In NIDDM patients 15-20% of total calories should be derived from proteins should get 1-1.5g proteins/kg body weight. Proteins from vegetables are better than proteins from animal foods, since they add fiber to diet.

**Fats** – fats contain soluble vitamins. 3 types of fats are:

- 1) Ghee, butter, vanaspati, coconut oil (saturated fats)
- 2) Sunflower and safflower (poly unsaturated fatty acids PUFA)
- 3) Groundnut oil, palm oil and olive oil (mono unsaturated fatty acids MUFA) type of fat and quantity of fat are important. 15-25% of total calories come from fats, non- vegetarian diabetes consume fish or chicken without skin, instead of egg, mutton , liver and brain that increase cholesterol. Diabetics can take 4 tea spoon of fat/day.

**Vitamins and minerals-** green leafy vegetables, fresh fruits , milk , cereals , nuts, fish and egg provide vitamins and minerals. During infection and other complications may require increased vitamins and minerals in form of supplements.

**Dietary fiber-** fiber is present in fruits, legumes, fenugreek(soluble fiber) control blood sugar, is more effective than insoluble fiber of cereals and millets. Dietary fibre can reduce cardiovascular disease. 25g fiber/1000kcal is recommended. Diabetics should consume low calorie foods with low glycaemic index.

**Fenugreek seeds-** certain mucilaginous fiber and total fiber is 20-50%. It contains trigonelline an alkaloid known to reduce blood sugar levels and serum lipid levels and have overall beneficial effect. 25g of fenugreek in 2 divided doses.

### **Dietary guidelines-**

- 1) Avoid sweets, sugar, honey, jam, cakes, fruit juices with sugar.
- 2) Use fats in limited amounts.
- 3) Use of cereals and pulses in right amounts.
- 4) Use high fiber foods as much as possible.
- 5) Use vegetables as desired.
- 6) Take permitted fruits in limited amount.



**Glycemic index-** extent of rise in blood sugar in response to a food in comparison with response to equivalent amount of glucose. Diabetics should consume low glycemic foods. Cereals and root vegetables have 65-75% glycemic index(GI), fruits and vegetables have 45-55% dried peas and beans have GI 45-55%. Diet alteration in associated disorders- diabetes with heart disease – fat intake to be limited. Diabetes with renal disease- protein intake to be limited.

Diabetes with HTN- salt intake to be limited.

Alcohol- alcohol intake may lower the blood sugar levels and result in hypoglycemic, continuous, consumption may lead to peripheral neuropathy, likely to cause overweight and obesity.

### **Exercise-**

- 1) exercise helps for general well being of diabetes.
- 2) Reduces body weight
- 3) Other risk factors for heart disease.
- 4) Increases peripheral circulation
- 5) Enhances action of insulin and reduce the dose of anti diabetic drugs.
- 6) Reduces stresses and strain.

Brisk walking, jogging, bicycling, swimming and playing, badminton and tennis. Diabetic patients on insulin should seek medical advise before energy in strain our exercise. Prevent hypoglycaemia and consume extra CHO before and after exercise.

**Insulin-** short acting, intermediate acting and long acting insulin are there. IDDM patients need regular breakfast, lunch, snacks, dinner and bed times snacks to avoid hypoglycemia.

Sometimes during the following conditions NIDDM subjects need insulin,

- 1) Drug acute infections
- 2) Surgery
- 3) Pregnancy
- 4) When oral drugs do not work.

**Oral dugs** – in most diabetic patients diet, exercise, weight reduction are enough to control high blood sugar. If blood sugar cannot be controlled with diet and exercise after 6-8 weeks drugs are prescribed. The anti diabetic drug tablets enhance the production of insulin or improve the action of insulin. Sulphonyl ureas and bi guanides are 2 group of drug used.

**Educatons-** diabetics should be educated on nature of disease and probability of development of acute and long term disease, importance of monitoring of blood sugar and lipids, urine sugar, symptoms of hypoglyce

**Ketoacidosis** - diabetics illness diabetics should be careful about diet and drugs. Urine should be tested and anti diabetic drugs should be taken.

**Glycemic index-** the foods that are more slowly absorbed may have metabolic benefits to diabetes. Glycemic index is a ranking of foods based on post prandial blood glucose. Response of a food compared with a reference food. The low glycemic foods are prescribed for diabetics. The composition of low glycemic foods influence glucose and lipid metabolism and HDL levels. The reduced rate of glucose