DIABETES: A SILENT KILLER DISEASE

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Abstract: *The group of ductless cells located in the space between the labules of pancreas are designated as Islet of Langerhans. This was discovered by Paul Langerhans of Germany in 1869. Being ductless these poor their secretion directly into the blood, hence represent the endocrine portion of the pancreas. The secretary elements of the pancreas are formed by proliferation of the primitive ducts. The islets of Langerhans are also derived from the primitive duct system. There are between one and two million islets in a pancreas, accounting for 1-2% of the weight of the pancreas. The diameter of each islet is about 20-30 μm. each islet consists of 4 kind of cells: -*

1. *α cells (or A)* – *constitute 25% of islet cells. Secrete glucagon.*
2. *β cells (or B)* – *constitute 60% of the islet cells. Secrete insulin.*
3. *γ cells (or D)* – *10% of the islet cells secrete somatostatin occasional one may secrete gastrin.*
4. *F cells (or PP)* – *<5% of the islet cells. Secrete pancreatic polypeptide.*

β cell produce an Insulin hormone and it is a protienous hormone. Insulin is an "anabolic hormone" so it is causes anabolism of carbohydrate-fat-protein. It consists of 51 amino acids arranged in 2 chains namely a chain and b chain. Diabetes is a main causes of the increase the level of sugar in blood. So it is called sugar disease. Deficiency of insulin causes diabetes. There are several type of diabetes. Type-I Diabetes is generally found in childhood but Type-II Diabetes is usually found in after 30-40 years old age person.

Fasting blood insulin concentration is about 10μu/ml and after taking a meal this level shoots up value like 50-70 μu/ml. According to WHO the fasting blood sugar level at health is between 70-110mg%. But only when the fasting level is >140mg% then the person is diabetic.

Obesity is the major causes of insulin resistance. Diet is the most important part of the life style. Diabetes patient take a sleep of 8 hours at night and do the physical work for the prevention of diabetes.

Key Words: *Diabetes, fasting, lipo-distrophy and auto-antibody.*

1. INTRODUCTION:

"Diabetes mellitus is a clinical syndrome characterised by hyperglycaemia due to absolute or, relative deficiency of Insulin."

"Diabetes mellitus is a chronic disease due to decrease or absolute off secretion of Insulin of the pancreatic β cells or there may be diminished action of Insulin, may be due to peripheral utilisation."

"The disease is characterised by hyperglycaemia (high blood glucose level). Other features may or may not be present. If left without or inadequate treatment, the victim tends to die prematurely." Diabetes mellitus (DM) is an ancient disease. In Sanskrit name of the disease 'Madhumeha' also means honeyed urine. Diabetes mellitus is commonly called as Sugar disease, is expressed as chronic glycosuria with polyuria. Diabetes is the main causes of deficiency of Insulin hormone. Insulin hormone is a synthesis of the Islet of Langerhans of β-cells of the pancreas.

2. CLASSIFICATION OF HYPERGLYCAEMIA CONDITIONS:

Chronic hyperglycaemia can be due to:

1. Primary cause – cause of chronic hyperglycaemia is Diabetes Mellitus (DM)
2. Secondary cause – Causes are due to such disease like
   i. Pancreatic injury (Cancer/Pancreactomy).
   ii. Cushing's syndrome.

Sub classes of primary causes (Diabetes Mellitus):

1. Insulin Dependent Diabetes Mellitus (IDDM)
   Also called "Juvenile Diabetes" or Type-I Diabetes Mellitus.
2. Non-Insulin Dependent Diabetes Mellitus (NIDDM)
   Also called "Maturity Onset Diabetes" or Type-II Diabetes Mellitus.

Obesity is the causes of diabetes, the hormone range increase in sugar level in blood called diabetes. Overweight gain is caused by Type-I diabetes appear. And underweight gain is caused by Type-II diabetes. Diabetes Mellitus is commonly called as metabolic disease. High blood sugar level can damage several organ like nerves, eye, kidney and other organs. Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin hormone, that regulate blood sugar level. Diabetes means hyperglycaemia, glycosuria, ketosis, acidosis, diabetes coma (unconsciousness), polyuria, weight loss in spite of polyphagia (condition of increase appetite) and polydipsia (condition of increase thrust) are the abnormal character of diabetes.

According to WHO a person is diabetic if plasma blood glucose level is –

Fasting > 7.8m mol/l (=140mg/100ml)

Post prandial > 11.1mmol/l (=200mg/100ml)

3. AETIOLOGICAL CLASSIFICATION OF DIABETES MELLITUS:

1. **Type-I Diabetes:**
Type-I Diabetes due to destruction of the β-cells bye auto immunity i.e., the cause of total destruction of β-cells.
   - It is Immune-Mediated.
   - Non-Immune-Mediated (Idiopathic).

2. **Type-II Diabetes:**
Non-Insulin Dependent Diabetes may be obese or non-obese relating deficiency or insulin resistance may be genetic defect, defect in chromosome 20,7. Genetic defect may be in Insulin action in the lipo-distrophy and auto-antibody.

   Secondary Type of Diabetes:
   - Genetic defects of β-cells function.
   - Genetic defects of Insulin action.
   - Certain disease like fibro calculous pancreatic disease, chronic pancreatic disease, primary and secondary carcinoma in pancreas, haemochromatosis in pancreas, endochronopathy, endochronotumour like glucogonoma, hyperthyroidism, hyperaldesteron also cause diabetes.
   - Drug abuse- like pantamidine, leucopanic acid, corticosteroids, thiazide diuretics, phenytoin.
   - Certain genetic syndrome- like Down's syndrome, Turner's syndrome, Fricdreich's syndrome, Klinefelter's syndrome.

3. **Gestational Diabetes**
The term Gestational Diabetes refers to hyperglycaemia occurring for the first time during pregnancy occurs in 24-28 weeks of pregnancy i.e., 6-7 months of pregnancy.

4. PHYSIOLOGY, PATHOPHYSIOLOGY AND INVESTIGATIONS

1. **Glucose Metabolism and Homeastasis**
In human blood glucose is tightly regulated by homeostatic mechanism and maintain within a narrow range of 3.5 to 6.5 mmol/l. A continuous supply of glucose is essential for brain, which uses glucose as its principle metabolic fuel. Insulin is the anabolic hormone and it has profound effect on the metabolism of carbohydrate fat and protein. Insulin is secreted from pancreatic β-cell into the portal calculation, with a brisk increase in response to a rise in blood sugar. Ketone bodies are organic acid which when form in small amount are oxidised and utilised as metabolic fuel.

   The normal adult pancreas containing about 1 million islets which scattered throughout the exocrine parenchyma.

2. **Metabolic Disturbances**
The Hyperglycaemia of diabetes develop because of an absolute (Type-1 Diabetes) or a relative (Type-2 Diabetes) deficiency of insulin, resulting in decreased anabolic and increased catabolic effects. In both Type 1 and 2 Diabetes the action of insulin are also impaired by insensitivity of target tissues. Glycosuria occurs when the plasma glucose concentration exceeds the renal threshold (the capacity of renal tubules to reabsorb glucose from the glomerular filtrate) at approximately 10 mmol/l.

Investigation

Urine Testing

Test urine for glucose and Ketones

1. **Glucose**

- Testing the urine from glucose is the usual procedure for detecting diabetes, using sensitive glucose-specific dipstick method.
- Major random or fasting blood glucose–   Fasting plasma glucose ≥ 7.0 mmol/l.
                                                                                     Random plasma Glucose ≥ 11.1 mmol/l.
- Glycosuria is common in normal pregnancy and in late pregnancy lactose appears in the urine. However, the finding of reducing substances in the urine of a pregnant woman should be majored to identify gestational diabetes.

2. **Ketones**

   Ketones is not pathognomonic of diabetes but, if associated with glycosuria, the diagnosis of diabetes is highly likely. In diabetes ketoacidosis, ketone can be detected in plasma using dipsticks.

3. **Protein**

   Dipstick testing for albumin is a standard procedure to identify the presence of renal disease in people with diabetes. This will detect urinary albumin greater than 300mg/l.

Blood Testing

When symptoms suggest diabetes, the diagnosis may be confirm by a random blood glucose concentration greater than 11 mmol/l. The diagnosis for diabetes mellitus recommended by the WHO in 2000 is oral glucose tolerance test (OGTT).

Fasting plasma glucose – 7.0 mmol/l or above.

Random plasma glucose – 11.1 mmol/l or above.

Type-1 Diabetes:

- **Genetic**

   Over 20 different regions of the human genome show some linkage with Type-1 diabetes but most interact has focused on the human leucocyte antigen (HLA) and on the short arm of chromosome-6. The region of the insulin gene on chromosome 11_p is also linked with Type-1 diabetes. Chromosomes 15_q, 11_q and 6_q gene products and modes of action.

- **Environmental factor**

   The development of Type-1 diabetes, concordance rate between monozygotic twin is less than 40% and environmental factor have an important role in promoting clinical expression of the dis disease. Risk of developing Type-1 diabetes in an individual whose relative with Type-1 diabetes-

Identical twins	-	35%
Non-Identical twins	-	20%
HLA-Identical sibling	-	16%
Non-HLA-Identical sibling	-	3%
Father	-	9%
Mother	-	3%
Both parents	-	up to 30%

- **Viruses**

   Some viral infection cause Type-1 diabetes is known from studies where virus particles known to cause cytopathic or auto immune damage to β-cells have been isolated from the pancreas. Example- Mumps, Coxsackie B_4, Retroviruses, Rubella, Cytomegalovirus and Epstein-Bar virus.

- **Diet**

   Bovine serum albumin (BSA) a major constituent of cow's milk has been implicated in triggering Type-1 diabetes. It has been shown the children who are given cow's milk early in infancy are more likely to develop Type-1 diabetes than those who are breast feed BSA may cross the neonatal gut and rise antibodies which because of the close homology between BSA and β chain of HLA class-II antigen and a heat-shock protein expressed by β-cells could cross-react with and cause damage to β-cell component.

   Various nitrosomines (found in smoked and curd meats) coffee and tea are also prone to Type-1 diabetes.

- **Stress**

   Stress may be stimulating the secretion of contour-regulatory hormones which develops the Type-1 diabetes.

- **Immunological factor**

   hyperglycaemia is the classical symptoms of the diabetes occurs only when 70-90% of β-cells have been destroyed.

   Type-1 diabetes is also associated with other autoimmune disorders including thyroid disease, coeliac disease, addison's disease, pernicious anaemia and vitiligo.

Type-2 Diabetes:

Type-2 diabetes commonly found in obese and insulin-resistant people.

- **Genetics**
  Genetic factor are more prone of type-2 diabetes. Type-2 diabetes are multifactorial in nature with interaction of environmental and genetic factor.
- **Environmental Factor**
  Life Style
  Type-2 diabetes provides evidence that overeating specially when combine with obesity and underactivity. The majority of middle aged diabetic people are obese, only a few obese people develop diabetes.

  Malnutrition in utero
  The malnutrition in utero may programme β-cell development and metabolic function at a critical period, so predisposing to Type-2 diabetes later in life. Smoking during pregnancy has also been implicated.

  Age
  Type-2 diabetes is principally a disease of middle aged and elderly affecting 10% of the population over the age of 65.

  Pregnancy
  During normal pregnancy insulin sensitivity is reduced through the action of placentral hormones and this affects glucose tolerance- The term Gestational diabetes refers to hyperglycaemia occurring for the first time during pregnancy. 80% of women with gestational diabetes ultimately develop permanent clinical diabetes requiring treatment.

  Pathogenesis of Type-2 diabetes
  Insulin Resistance
  Insulin resistance may be due to any one of three general causes: an abnormal insulin molecule, an excessive amount of circulating antagonists and target tissue defect. The last is the most common cause of insulin resistance in Type-2 diabetes.

  Pancreatic β-cell failure
  Small quantities of islets amyloid are very common in elderly non-diabetic patient, and the role of islets amyloid in the pathogenesis of Type-2 diabetes is uncertain. Some people with Type-2 diabetes most of whom are not overweight have advance pancreatic β-cell failure at the time of presentation and require early treatment with insulin.

5. COMMNEST COMPLICATION OF DIABETES:

- **RETINOPATHY**
  Cataract is very common.
  Impaired and diminished vision.
  30-40% blindness in the world is due to diabetes.
- **Nephropathy**
  Micro albunuria – normal level is 30mg/day.
  Normal keratin level is 2mg.
  Around 20-30% of people with diabetes develop kidney disease (Diabetic Nephropathy).
- **Neuropathy**
  Peripheral or Autonomic neuropathy may present. Peripheral neuropathy more common complain tumbling, lumbling, burning sensation, pen touch sensation in lower limb may present, ulcer, gangrene too. Autonomic neuropathy may present with excessive sweating of upper and lower limb. Palpitation make trachycardia. Hemiplegia, paraphlagia, hemorage may also present.
- **Neuralgia**
  Pain in whole body. Diabetic person can't sleep due to pain.
- Skin problem
  More prone of skin disease, more chance of ring worm, scabies, soft tissue infection, wound may be delayed healing.
- **Sexual deficiency**
  Loss and decrease in libido.
- **Parker Theory**
  Very low body weight and premature born lady may have suffered from diabetes.
- **Genetic factor**
  Progressive loss of weight polyuria polyphagia.

Symptoms of Diabetes

Dry mouth, Thrust, Hunger
Nausea, Headache
Polyuria, Nocturia
Blurring of vision
Recent change in weight, weight loss
Tiredness, fatigue, obesity, irritability, apathy
Pruritus valvae, dry skin itching, balanitis (Genital candidiasis).
Hyperphagia, predilection for sweet food
Poor muscles health, decrease sexual desire, erectile disfunction.

Prevention of Diabetes:

- Prevention of diabetes is most important part of life style diet plan or change of life style in diet.
- Strategies such low carb diet and exercise help to reduces level of insulin.
- Do the physical work, physical activity, exercise, walking.
- Diabetes patient should take green leafy vegetables and avoid red meat, carbohydrate rich food.
- Avoid ice-cream and cold-beverage.
- Avoid the tension, stress, smoking and alcohol.
- Diabetes patient take a sleep of 8 hours at night.
- Balance of omega fatty acid 3 & 4.

Aim of Treatment

To make the patient asymptomatic.

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