

# An Complete overview on Type 2 Diabetes Mellitus

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**Abstract:** Type-2 diabetes mellitus or non- insulin dependent diabetes mellitus result from insulin resistance a condition in which cell fails to use insulin properly with or without an absolute insulin deficiency this type was previously referred to as or adult onset diabetes .the third main type is gestational diabetes which occur when women without previous history as diabetes develop a high blood glucose level during her pregnancy, it may pr eud development of type -2 diabetes mellitus.

Consequently treatment involve lifestyle modification, treat of obesity, oral hypoglycaemic agent, insulin, exercise ,diet management, pharmacotherapy, herbal drug can be used. the present review therefore is an attempt to focus on physiological aspect of diabetes, it's complication, goals of management, synthetic and herbal treatment of diabetes

**Keywords:** Type -2 diabetes mellitus, diagnosis, management

## INTRODUCTION

Diabetes:

Diabetes mellitus is a chronic disorder of carbohydrates, fats, and protein metabolism. A deficiency or deficient insulin secretory response which translate into impaired carbohydrates (Glucose) use is a characteristic feature of diabetes mellitus as is the resulting hyperglycaemias Disease mellitus is commonly referred to as a sugar and it is the most common endocrine disorder and usually occurs when there is deficiency or absence of insulin or rarely impairment of insulin activity The international diabetes federation estimate the total number of diabetes subject to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025. Insulin and Glucagon hormone both are secreted by the pancreas insulin by the ( $\beta$ ) Beta cell and Glucagon is secreted by ( $\alpha$ ) Alpha cell both are located in the islet of Langerhans insulin decrease the blood glucose level by the glycogenesis and transport glucose into the muscle, liver and adipose tissue. Neural tissue and erythrocyte do not required insulin for glucose  $\alpha$  cell control blood glucose by producing Glucagon and it increases the blood glucose level by accelerating the glycogenolysis. In addition to increased risk of obesity, metabolic, and cardiovascular disorder and malignancy in future life of fetus after delivery. Type -II diabetes mellitus comprises 80% to 90% of all cases of diabetes mellitus more over

people with diabetes who undertake moderate amount of physical activity are at in appreciably where risk of death than inactive person. In diabetes there is an aberration either in the synthesis or secretion of insulin as serve in Type -1 diabetes mellitus and stenosis in the pancreatic duct or the development of resistance to insulin or its subnormal production as in case of Type-2 diabetes and certain secondary diabetes.

## Classification

The most common and important form of primary or idiopathic diabetes mellitus which is focus of our discussion it must be different from secondary diabetes mellitus which includes form of hyperglycaemias associated with identifiable causes in which destruction of pancreatic islet is induced by inflammatory pancreatic disease, surgery tumour, certain drug iron overloaded (Hemochromatosis) and certain acquired or genetic endocrinopathies. The classification enclose both clinical stage and aetiological type of diabetes mellitus and other category of hyperglycaemia. Assigning a type of diabetes to an individual often depends on circumstances present at the time of diagnosis and many diabetes individual do not easily fit into single class primary diabetes mellitus probably represent a heterogeneous group of disorder that have hyperglycemia as a common feature.

### Eating

Blood glucose concentration

Beta cells stimulated to secrete insulin

Blood insulin concentration

Glucose transport into cells

Liver glycogenesis Glucose metabolism by the cells

Blood glucose concentration

Hopefully, back to normal blood glucose concentration

The new classification of diabetes mellitus contain stages which reflect the various degrees of hyperglycaemia in individual subject with any of disease process which may lead to diabetes mellitus.

### Fasting

Decrease in blood glucose concentration

Alpha cell stimulated to secrete Glucagon

Liver glycogenolysis

Blood glucose concentration

Hopefully, back to normal blood glucose concentration. The old and new term of insulin dependent or noninsulin dependent which were proposed by WHO in 1980 and 1985 have disappeared and the term of new classification system identifies four type of diabetes mellitus other specific type and gestational diabetes WHO except committee.

Hence classification of diabetes mellitus is described as below.[1]

Insulin dependent diabetes mellitus (Type -1):-

This type of diabetes mellitus is also called auto immune diabetes and previously Known as juvenile onset or ketosis prone diabetes. Type-1 diabetes mellitus this occurs mainly in children and young adult the onset is usually sudden and can be Life threaten in. Type-1 is usually characterized by presence of anti-glutamic acid decarboxylase, islet cell or insulin antibodies which identify the autoimmune processes which lead to Beta

cell destruction there is a severe deficiency or absence of insulin secretion due to destruction of Beta islet cells of the pancreas treatment with injection of insulin is required. markers of immune destruction including islet cells, auto antibodies and/or auto antibodies to insulin and auto antibodies to glutamic acid decarboxylase are present in 85-90% of individual with Type-1 diabetes mellitus when fasting diabetes hyperglycaemia is intiallydetected.[2]

Non-insulin depend diabetes mellitus (Type -2):-

It is also known as adult-onset diabetes progressive insulin secretary defect on the background of insulin resistance. People with this type of diabetes frequently are resistant to the action of insulin the long-term complication in the blood vessels, kidney, eye, nerves occur in both types are the major causes of morbidity and death from diabetes.

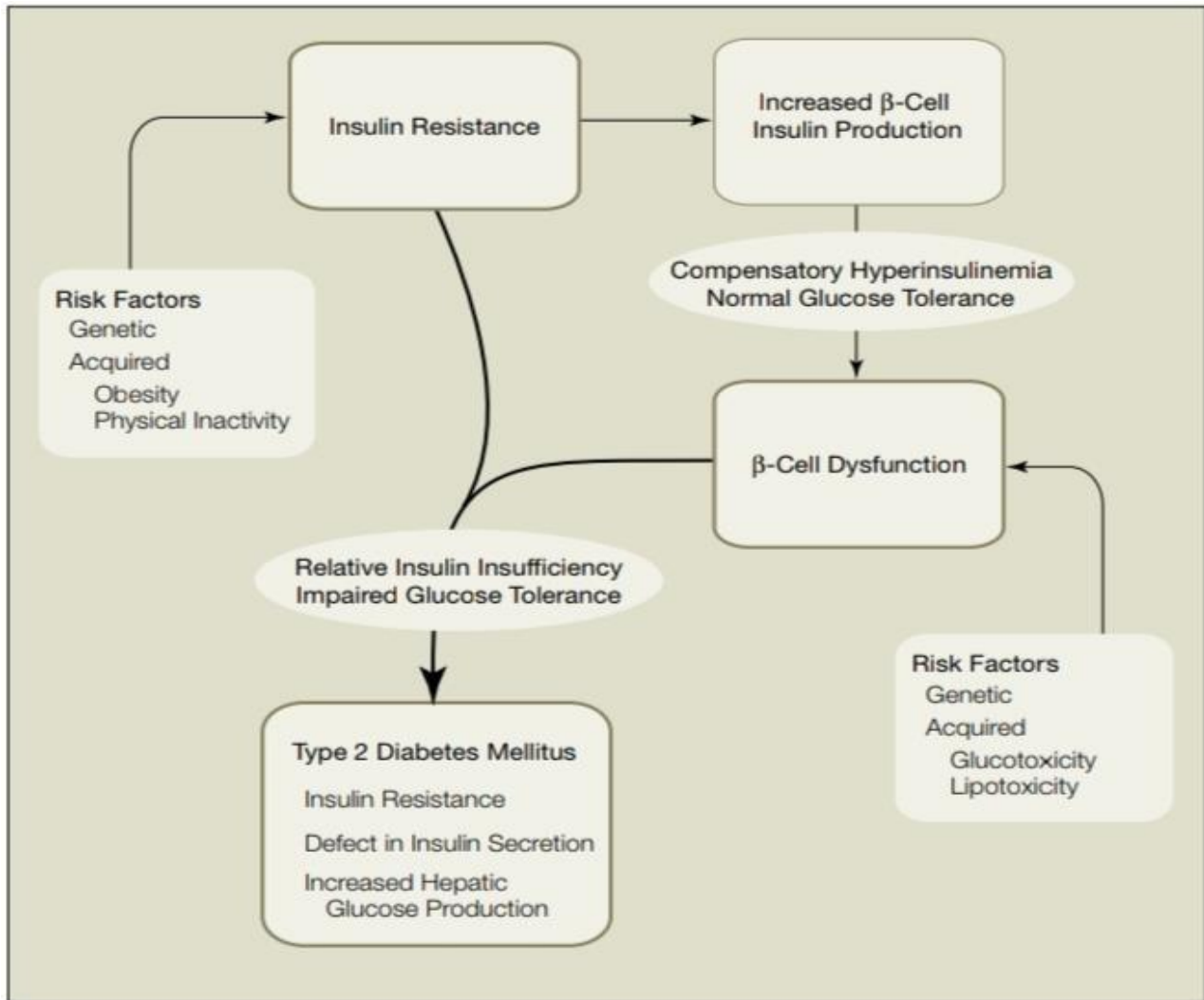


Fig1:-flow chart showing relationship between insulin, diabetes cells involved in it and risk factor for it

Oxidative stress:

Oxidative strain is an imbalance of unfastened radicals and antioxidants with inside the frame which could result in mobileular and tissue damage. However, cells additionally produce antioxidants that neutralize unfastened radicals. Several elements make contributions to oxidative strain and extra unfastened radical productions.

These elements can include:

Diet

Lifestyle

Environmental elements along with pollutants and radiation

The frame's herbal immune reaction also can cause oxidative strain temporarily. Uncontrolled oxidative strain can boost up the aging system and can make contributions to the improvement of a no .of situations.

Factors that could growth a person's danger of long-time period Oxidative strain consists of:

Obesity

Pollution

Certain medications

Alcohol consumption

Exposure to pesticide or industrial

Smoking cigarettes or different tobacco products

factor responsible for these include obesity, sedentary life, increasing age.

Gestational diabetes mellitus:-

The glucose intolerance occurring for the first time or diagnosed during pregnancy is referred to as gestational diabetes mellitus. Women who develop Type-1 diabetes mellitus during pregnancy and women with undiagnosed asymptomatic type-2 diabetes mellitus that is discovered during pregnancy are classified with gestational diabetes mellitus. Gestionaldiabetes mellitus may develop during pregnancy and may disappear after delivery. But may have greater risk of obesity and later in life attributed to effect of intrauterine exposure to

hyperglycaemia.[3]

Other specific type (monogenic type):-

The most common form of monogenic type of diabetes is developed with mutation on chromosome 12 in a hepatic transcription factor referred to as hepatocytes Nuclear factor/gentic defect of beta cell. They are characterized by onset of hyperglycaemia at an early age with defect of insulin action person with disease of exocrine pancreas such as prancrtitis fibrous person with dysfunction associated with other endocrinopathies. Some drug also used in combination with the treatment of HIV/AIDS/or organ transplantation genetic abnormalities that result in inability to convert proinsulin to insulin.[3]

Causes of diabetes mellitus:-

Disturbance or abonormility in glucoreceptorof  $\beta$ -cells so that they respond to higher glucose concentration or realvtive $\beta$ -cells. Deficiency in either way insulin secretion is impaired may progress to  $\beta$  cell failure.

Some of direct effect of hyperglycaemia on neuronal metabolism Reduced sensitivity of peripheral tissue to insulin reduction in number of insulin receptor down regulation of insulin receptor.

Excess of hyperglycaemia hormone (Glucagon) etc. Obesity causes relative insulin deficiency the  $\beta$  Cells lag behind 2 theories have demonstrated abnormalities in nitric oxide metabolism, resulting in Altered perineural blood flow and nerve damage.

Due to imbalance of specific receptor factor can cause diabetes mellitus some specific receptor are Glucagon like peptide -1 receptor, peroxisome proliferation activated receptor Beta 3 ardent receptor some enzyme like  $\alpha$ - glycosidase dipeptidyl peptidaseIVenzyme etc.

Current research on diabetes neuropathy is focused on oxidative stress, advanced glycationend product, protein, kinase and polyol pathway.[4]

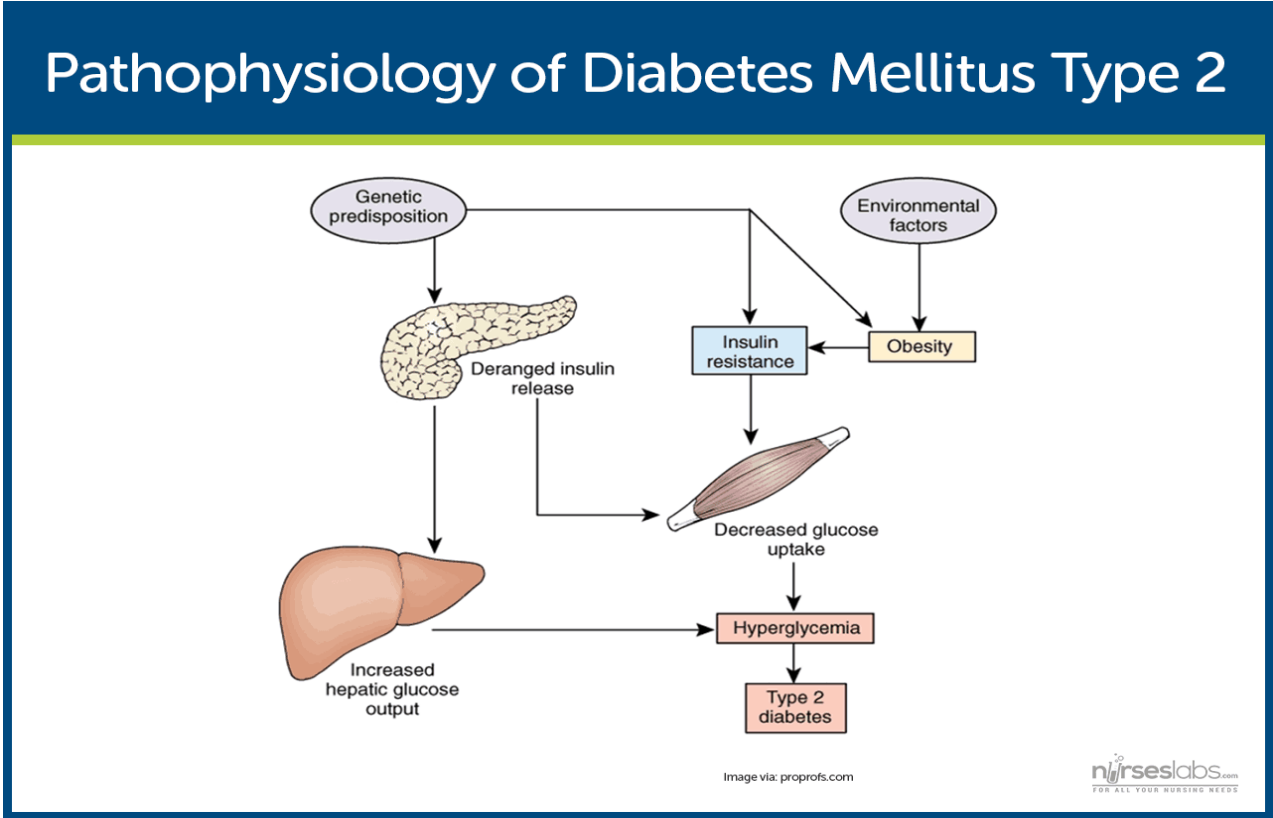


Fig2:- Diagram showing Pathophysiology of Diabetes Mellitus -2 [figure-2][4]

**Diagnosis:-**

Diagnosis should never be made on the basis of single abnormal blood glucose value. Diagnosis involves

Urine sugar, blood sugar, Glucose tolerance test, renal thresholds of glucose, diminished Glucose tolerance, increase glucose tolerance, renal glycosuria, extended Glucose tolerance curve, cortisone stressed Glucose tolerance test, intravenous Glucose tolerance test, oral Glucose tolerance test.

**Common sign and symptom:-**

In these cell fails to metabolize glucose in normal manner, effectively become starved. In long term diabetes mellitus may lead to renal failure, and neuropathy that may lead to renal failure and neuropathy with risk of foot ulcer.

Other various symptoms are observed due to –  
Gluconeogenesis from amino acid and body protein causing muscle wasting, tissue breakdown and further increase the blood glucose level.

Catabolism of body fat, releasing some of its energy and excess production of ketone bodies.[5]

**Treatment:-**

The insulin requirement comes back to normal once the condition has been controlled the aims of management of diabetes mellitus can be achieved by-

- Impaired glucose tolerance
- hypertension
- Dyslipidemia
- obesity
- Macrovascular disease
- lifestyle improvement
- pharmacological intervention[6]

**Early stage diabetes**

- Over diabetes
- Microvascular disease

**New diabetic patients:-**

Blood sugar HbA1C, body weight (recent changes)  
Checks for urinary ketone bodies complication and contraindicator for exercise therapy.  
Instructions on dietary therapy Insulin therapy should aim to mimic nature which is remarkably successful both in limiting postprandial hyperglycaemia and preventing hypoglycaemia between meals.

Site of administration of insulin injections is equally important for better and safe action of insulin and can be given intramuscular or intravenous route.[7]

Different preparation of insulin

Human insulin

Beef insulin

Pork insulin

The most important adverse effect are weight gain and when in appropriate dose of insulin is taken and when there is mismatch between meals and insulin injections. Sulfonyl ureas such as glibenclamide, glipizide, and biguanide such as metformin, phenformin are oral hypoglycaemic drug

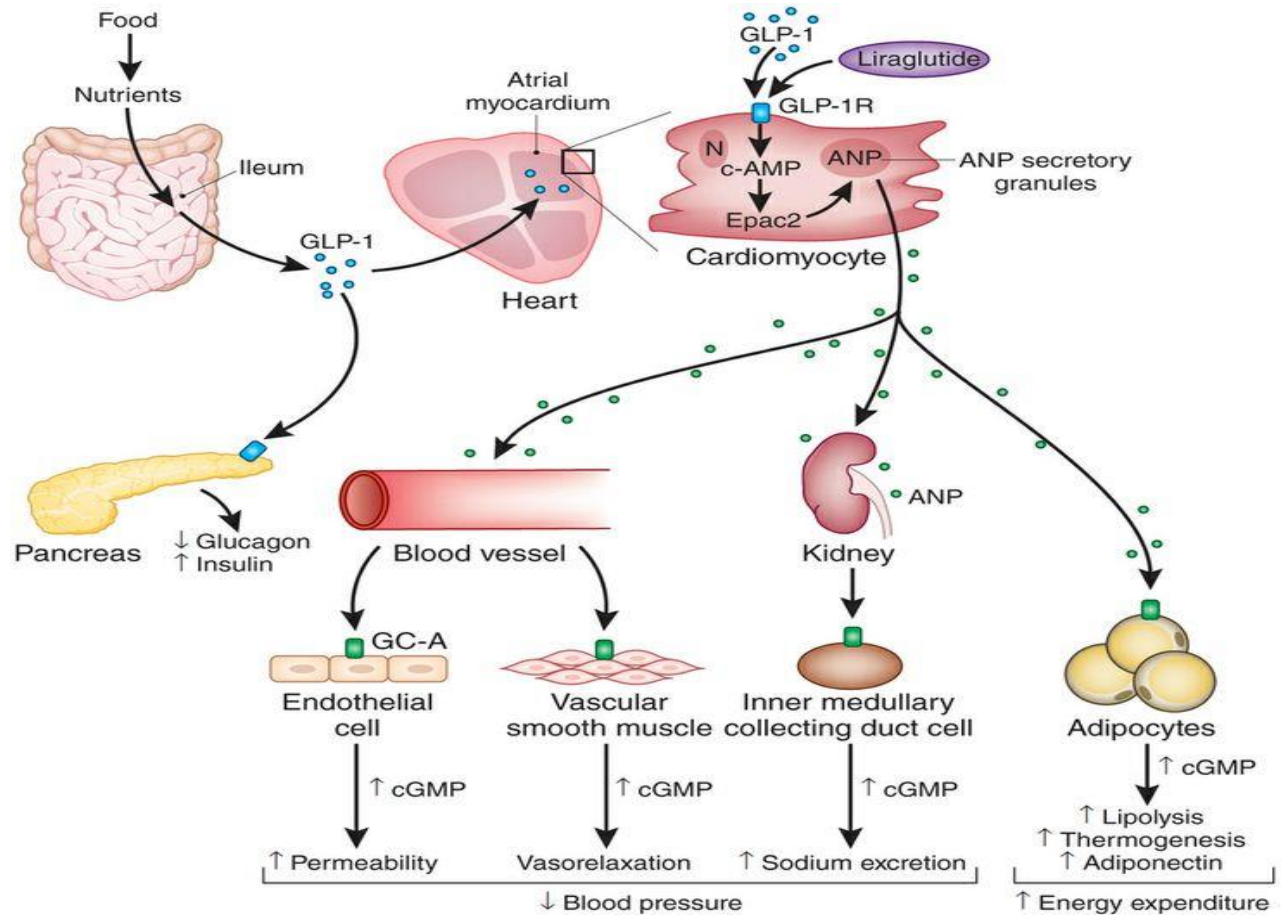


Fig3:- Diagram showing multiple organ involvement in utilization of glucose and formation of cGMP[6]

Type of therapy involved in diabetes mellitus –

Stem cell therapy	Researcher have shown monocytes/macrophage may be main player which contribute to the chronic inflammation and insulin resistance in type-2 diabetes mellitus pateint. Multipotent stem cell are introduced in patient.[8,9,10]
Antioxidant therapy	A variety of antioxidant like Vitamin supplements, Vit C , E, plant deriueactu substance are used.[8]
Anti-inflammatory therapy	The changes indicate that inflammation play pivotal role in pathogenesis of T2DM it include altered level of specific cytokine and chemokines.[8,9,10]
Dietary management	-Balance in protein, carbohydrates, fats. -Food intake should be divided into regular spaced meal of similar size -Reduced calories -Must have constant dietary habit -Use of ginger, blueberry, cranberry, otes.[8,9,10,11,12] -yoga.
Newer insulin delivery device	Insulin syringes, Insulin pen device, Inhaled insulin, Insulin pump, Implantable pump. [8,9,10,11,12]

## CONCLUSION

Type-2-DM is a metabolic disease that can be prevented through lifestyle modification, diet control, and control of overweight and obesity. New drug are being developed yet no cure is available in sight for the disease, despite new insights into pathopsiology of the disease management should be tailored to improve quality of life of individual with type 2 DM

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