

CD Alert

National Centre for Disease Control,
Directorate General of Health Services, Government of India

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DIABETES: *Special edition on occasion of World Health Day 2016*

'Beat diabetes – scale up prevention, strengthen care and enhance surveillance'

INTRODUCTION

India has the 6.51 crore diabetes cases which is second highest number of diabetics in the world and is projected to have 10.9 crore affected persons by 2035. The prevalence of diabetes in the country is 9%. It is estimated that there are another 3.5 crore undiagnosed cases of diabetes in India. Non Communicable Diseases account for 0.98 crore deaths in the country and of all deaths 2% are due to diabetes annually.

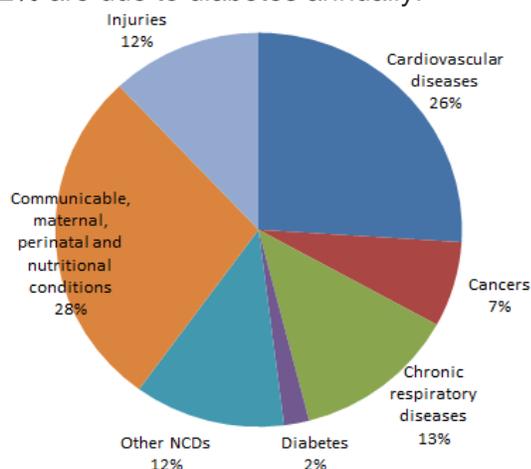


Fig 1. NCD Country Profile India (2014)

(Source: World Health Organisation 2014)

DEFINITION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.

The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

CAUSES OF DIABETES

Several pathogenic processes are involved in the development of diabetes. These range from destruction of the β - cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action. Impairment of insulin secretion and defects in insulin action frequently coexist in the same patient, and it is often unclear which abnormality, if either alone, is the primary cause of the hyperglycemia.

TYPES OF DIABETES

There are two type of diabetes.

1. Type 1 diabetes (insulin dependent) is due to autoimmune mediated destruction of β -cells of the pancreas, resulting in absolute insulin deficiency.
2. Type 2 diabetes (non-insulin dependent) is characterised by insulin resistance and/ or abnormal insulin secretion.

Type 2 diabetes accounts for over 90% and Type 1 accounts for up to 10% of all diabetes.

SYMPTOMS OF DIABETES

Diabetes may be symptomless for many years before it is detected.

Common symptoms of diabetes are:

- Polyuria
- polydipsia
- weight loss
- polyphagia
- Blurred vision.
- susceptibility to certain infections

Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or non-ketotic hyperosmolar syndrome.

DIFFERENTIATION OF TYPE 1 AND TYPE 2

A person is likely to have Type 1 diabetes if:

- Age at onset or diagnosis is below 25 years
- Abrupt onset symptoms
- Prone to ketoacidosis
- Dependent on exogenous insulin to sustain life
- BMI < 18.5 kg/m²

A person is likely to have type 2 diabetes if:

- Onset is gradual
- Obese/ Overweight
- Features of Insulin resistance – Acanthosis Nigricans
- Age at onset or diagnosis more often above 25years but can be seen at younger ages also
- Family history of type 2 diabetes common

COMPLICATIONS

Diabetes affects all the organs in the body. Complications due to diabetes include

- retinopathy with potential loss of vision;
- nephropathy leading to renal failure;
- peripheral neuropathy with risk of foot ulcers amputations, and Charcot joints;
- autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction;
- atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular disease;
- Hypertension and abnormalities of lipoprotein metabolism

(Source:

http://care.diabetesjournals.org/content/31/Supplement_1/S55.full.pdf)

DIAGNOSIS

Indications of a person with diabetes are

- i. Symptoms of diabetes plus casual plasma glucose ≥ 200 mg/dl
- ii. Fasting plasma glucose ≥ 126 mg/dl
- iii. 2 hr post 75 grams glucose ≥ 200 mg/dl

(Source: Guidelines for Management of Type 2 Diabetes, Indian Council of Medical Research, 2005)

Diagnosis of diabetes is made by Oral Glucose Tolerance Test (GTT) using venous blood of the patient. Criteria for diagnosing diabetes are in the table below:

Diagnosis	Fasting Glucose mg/dl	2 hr Post Glucose (75g) Load mg/dl
Diabetes	≥ 126	≥ 200
Impaired GTT(IGT)	< 110	> 140 to < 200
Impaired Fasting Glucose (IFG)	≥ 110 to < 126	

Prediabetes status is characterised by Impaired GTT or Impaired Fasting Glucose.

(Source: Operational Guidelines (Revised 2013-17) NPCDCS, Government of India (2013))

GOALS FOR TREATMENT

The goals of management of diabetic Patients are.

- Relief from diabetic symptoms and improvement of quality of life
- Prevention of acute complications
- Prevention of microvascular complications like retinopathy, neuropathy and nephropathy
- Prevention of macrovascular complications like cardiovascular, cerebro-vascular and peripheral vascular disease
- Prevention of infection

(Source:

http://care.diabetesjournals.org/content/31/Supplement_1/S55.full.pdf)

SCREENING FOR DIABETES

As per National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular disease and Stroke (NPCDCS) opportunistic screening should be undertaken for all individuals above 30 years.

Asymptomatic individuals may be screened if they fulfil the following criteria:

- **Age \geq 30 years**
- **BMI \geq 23 kg/m²**
- **Waist Hip ratio: men $>$ 0.90, women $>$ 0.85**
- **Family history of diabetes**
- **Sedentary lifestyle**
- **Previous impaired GTT or Fasting Glucose**
- **Gestational DM , recurrent foetal loss or delivery of large babies**
- **Hypertension (BP $>$ 140/90)**
- **Dyslipidemia**

(Source: Operational Guidelines (Revised 2013-17) NPCDCS, Government of India (2013); Guidelines for Management of Type 2 Diabetes, Indian Council of Medical Research, 2005)

TREATMENT

Treatment of diabetes underlines both Non-pharmacological and pharmacological interventions.

Non-pharmacological management is the cornerstone for management of diabetes mellitus. This includes healthy diet and regular physical activity.

Diet – The main aim of dietary management is to maintain ideal body weight, euglycemia, and desirable lipid profile and prevent and postpone diabetes related complications.

- i. Calorie intake is adjusted to maintain Ideal Body Weight (IBW).
- ii. Of the total calories 55-60% should be from carbohydrates, 10-15% from proteins and 20-25% from fats.
- iii. Saturated fats should be less than 7% of total caloric intake. Rest should be from mono and poly unsaturated fats
- iv. Transfatty acids/ hydrogenated vegetable oils are to be avoided
- v. Oils containing linoleic acid (groundnut, safflower, sesame, cottonseed and rice bran) should be used with oils containing α -linoleic acid (soya bean, mustard and canola)
- vi. Protein from vegetable sources, low fat milk/ milk products, fish and lean meat are preferred
- vii. Diet should also comprise of fibre rich foods such as whole grains, whole pulses, soyabean, green leafy vegetables, fenugreek seeds
- viii. Whole fruits are recommended in moderation. Very sweet fruit and fruit juices should be avoided
- ix. Common salt should be restricted to up to 6 g per day. Pickles, papad, chutney and salty processed foods should be avoided
- x. Alcohol intake should be in moderation and use of tobacco in any form should be prohibited.

Physical activity – Regular physical activity is essential since it has several benefits such as improvement in insulin sensitivity, reduction in hypertension, reduction of weight, improvement of lipid profile, improvement of cardiac function and increase in bone density.

- i. Before beginning an exercise programme a diabetic individual should undergo thorough medical evaluation with appropriate diagnostic studies
- ii. Appropriate footwear must be worn
- iii. Exercise must be done regularly
- iv. Brisk walk for 30-60 minutes or its equivalent physical activity is recommended

The practice of yoga helps therapeutically and promotes physical and mental health.

Pharmacological treatment- Comprises of various anti-diabetic agents which act by modifying factors causing hypoglycaemia.

(Source: Guidelines for Management of Type 2 Diabetes, Indian Council of Medical Research, 2005)

People with screen- positive for prediabetes should be monitored for development of diabetes annually and simultaneously screened and treated for modifiable risk factors for cardiovascular disease such as hypertension, dyslipidemia, smoking and alcohol consumption.

Individualized treatment of diabetes

- i. For a patient diagnosed with diabetes consider a combination of metformin and one of the treatment options based on patient age, BMI, CKD, duration of diabetes, established CVD, financial condition, Glycaemic status and hypoglycaemia concern (Fig 2 on page 5).
- ii. Drug choice should be based on patient preferences as well as presence of various comorbidities and complications and drug characteristics with the goal of reducing blood glucose levels while minimising side effects, especially hypoglycaemia and weight gain.

A person suffering with diabetes should carry quick acting carbohydrates and diabetes identification card

FOLLOW UP IN DIABETES

Regular monitoring and follow up is essential in diabetes. The parameters which need to be followed regularly are:

- **Blood sugar** – Fasting and 2 hours PP
- **HbA1c** – every 3 to 6 months
- **Clinical examination in each visit** – minimum 3 monthly
- **Optimum weight, BP and serum lipids** is to be maintained
- **Screening for long term complications** like retinopathy, nephropathy, peripheral vascular disease
- **Foot care** to encouraged
- **Discourage** tobacco use
- In children, **growth monitoring** is essential.

Annual checkups are needed for

- Serum lipids
- Ophthalmology checkup/ fundus examination (through dilated pupil)
- Blood urea/ serum creatinine
- Urine – protein/ albuminuria, micro-albuminuria
- ECG in those above 40 years of age

(Source: Guidelines for Management of Type 2 Diabetes, Indian Council of Medical Research, 2005)

COMORBIDITIES

Diabetes is complicated by the presence of infectious diseases, including TB. About 10% of TB cases globally are linked to diabetes. It is important that proper care for diabetes is provided to those that are suffering from TB/diabetes. People with diabetes who are diagnosed with TB have a higher risk of death during TB treatment and of TB relapse after treatment.

(Source:

http://www.who.int/tb/publications/diabetes_tb.pdf)

EYE COMPLICATIONS

Diabetic retinopathy is a microvascular complication of diabetes mellitus and is the cause of blindness in approximately 2.5 million of the estimated 50 million blind people in the World. Global projections suggest that 20% -30% of diabetic patients are likely to develop diabetic retinopathy. It is projected to become a major cause of visual disability in Indians as the country faces an explosive rise in the prevalence of diabetes mellitus. The risk of blindness from diabetes increases several fold in patients with concurrent hypertension and nephropathy. Blindness from retinopathy results from the development of macular edema, vitreous hemorrhage and retinal detachment.

Risk factors for the development of retinopathy and visual loss include type of diabetes, duration of diabetes, poor glycemic control, poor blood pressure control, deranged lipid profile, obesity, obstructive sleep apnea (OSA), pregnancy and anaemia. The duration of diabetes is probably the strongest predictor for development and progression of retinopathy. During the first two decades of disease, nearly all patients with type1 diabetes and about 70% of patients with type 2 diabetes have retinopathy. Poor diabetes control is another strong risk factor for the development and progression of diabetic retinopathy.

Diabetic retinopathy changes are usually bilateral and more or less symmetric.

It shows progression from minimal to mild non proliferative abnormalities, characterized by increased vascular permeability, to moderate and severe non proliferative diabetic retinopathy (NPDR), characterized by retinal ischemia, to proliferative diabetic retinopathy (PDR), characterized by the growth of new

blood vessels on the retina and disc (fig 3).



Figure 3- Neovascularization at disc (NVD)

Macular edema, characterized by retinal thickening from leaky blood vessels, can develop at all stages of retinopathy (fig 4).



Figure 4- Diabetic macular edema (DME)

Until a decade ago, the mainstay in the treatment of diabetic maculopathy and proliferative retinopathy was laser photocoagulation. The aim of laser treatment was to prevent or retard the risk of further moderate to severe visual loss. Currently, intravitreal pharmacotherapy with anti-vascular endothelial growth factor inhibitors and corticosteroids has been shown to be very beneficial.

However, the most effective way of preventing the risk of vision loss from diabetes mellitus is patient education about the need for screening for retinopathy even in the absence of any visual complaints. This unfortunately, is too often, the most neglected aspect in the care of patients with diabetes mellitus.

FOOT CARE IN DIABETES

In India, prevalence of foot ulcers in diabetic patients in clinic population is 3%. Over 85% of lower limb amputations are preceded by foot ulcers and diabetes remains a major cause of non-traumatic amputation. Diabetic patients should inspect feet every day, and seek care early if they get a foot injury (Fig 5 on Page 8). A health care provider should perform a complete foot examination at least once a year - more often if foot problems exist.

(Source:

http://www.apiindia.org/pdf/medicine_update_2012/diabetology_10.pdf)

NATIONAL PROGRAMME FOR PREVENTION AND CONTROL OF CANCER, DIABETES, CARDIOVASCULAR DISEASES AND STROKE (NPCDCS)

In order to prevent and control major NCDs including Diabetes, the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was launched in 2010, with focus on strengthening of infrastructure, human resource development, health promotion, screening for early diagnosis, treatment and referral. Provision has been made under the programme to provide free diagnostics and drugs for patients attending the designated NCD clinics.

The programme, attempts to achieve behaviour change in the community to adopt healthy life styles including dietary patterns, enhanced physical activity and reduced intake of tobacco and alcohol resulting in overall reduction in the risk factors of common Non-Communicable Diseases in the country.

The programme is being scaled up to cover all districts in the country by March 2017. Government of India has accorded

approval under State Programme Implementation Plan (PIP) to take up the programme in 468 districts. Presently, 201 District Hospitals and 1362 Community Health Centres are having NCD clinics to provide NCD services. In addition, States are also organizing Outreach Camps from time to time for screening of Diabetes and referral to NCD clinics.

Diabetes services under NPCDCS
Screening of persons above 30 years and pregnant women by Health Workers for

- ✓ **Diabetes by blood sugar strip method**
- ✓ **Health promotion and lifestyle modification**
- ✓ **Referral for confirmation and starting treatment**

Out of the 5.57 crore persons screened for Diabetes till 31st March 2014, 6.14% were suspected to be Diabetics. As per this data, states of Gujarat (9.04%), Karnataka (8.79%), Andhra Pradesh (6.98%), Bihar (7.44%), Punjab (9.06%) and Sikkim (13.62%) have higher prevalence of suspected cases of Diabetes as compared to the national prevalence. The suspected prevalence of Diabetes in Urban slums was also higher (11.77%).

(Source: NPCDCS, Government of India (2016))

SERVICES UNDER AYUSH

Diabetes can be treated through various systems of medicines. AYUSH systems of medicine have lot to offer in the management of Diabetes. AYUSH is the acronym of the Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy. Out of this Yoga and Naturopathy are drugless therapies. The principles of all the other four systems are more or less similar, all these systems believe in holistic way of treatment. They are useful for controlling the diabetes as well as preventing its complications.

(Source: Radha B by email, Advisor Homeopathy, Ministry of AYUSH (2016))

Fig 5 Simple steps to avoid diabetic foot problems



Poorly fitting shoes are one of the biggest culprits of diabetic foot complications. In case of red spots, sore spots, blisters, corns, calluses, or consistent pain associated with wearing shoes, new proper fitted shoes must be obtained immediately. Additionally, for common foot abnormalities such as flat feet, bunions, or hammer toes, modified footwear or orthosis may be necessary to protect feet from further damage [11]. Check with doctor immediately in case of ulceration of foot. Special dressings, Total Contact Casting, Modified footwear and orthosis are available for treatment of ulcers.

(Source: Foot Care, Foot Complications, Living with Diabetes, American Diabetes Association (website: <http://www.diabetes.org/living-with-diabetes/complications/foot-complications/foot-care.html?referrer=https://www.google.co.in/> ADA accessed on 10 March 2016)

...about CDAlert

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