Diabetes Mellitus

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DIABETES MELLITUS

- A heterogenous group of diseases
- A state of chronic hyperglycemia
    - Environmental
    - Genetic
- Defective production / action of insulin – G, F, A A
- Long term disease
    - Variable manifestation
    - Progression
- Cardiovascular, renal, neurological, ocular & others as intercurrent infections.

Diabetes

- Diabetes is a chronic disease that occurs either when:

➢ the pancreas does not produce enough insulin or

➢ the body cannot effectively use the insulin it produces.

- Leads to serious damage to many of the body's systems, especially the nerves and blood vessels.

A. *CLASSIFICATION OF DIABETES MELLITUS AND ALLIED CATEGORIES OF GLUCOSE INTOLERANCE*

B. *Clinical Classes*

Diabetes Mellitus (DM)

Insulin – dependent diabetes mellitus (IDDM)

Non-insulin – dependent diabetes mellitus (NIDDM)

a. *Non-obese*

b. *Obese*

***Malnutrition** – related diabetes mellitus (MRDM)*

***Other types** of diabetes associated with certain conditions and syndromes:*

1. *Pancreatic disease*
2. *Disease of hormonal etiology*
3. *Drug – induced or chemical induced conditions*
4. *Abnormalities of insulin or its receptors*
5. *Certain genetic syndromes*
6. *Miscellaneous*

IMPAIRED GLUCOSE TOLERANCE (IGT)

a. Non-obese
b. Obese
c. Associated with certain conditions and syndromes

Gestational diabetes mellitus (GDM)

***B. Statistical risk classes* (subjects with normal glucose tolerance but at substantially increased risk of developing diabetes)**

Previous abnormality of glucose tolerance
Potential abnormality of glucose tolerance

(From WHO Study Group on Diabetes Mellitus1985).

PROBLEM STATEMENT

- An iceberg disease
- 171 m → 366 m
  (2000) (2030)
  2.8% 4.4%
- 80% cases developing countries
- Industrialization, urbanization & socioeconomic development
- ↑ urban / rural population ratio
- ↑ obesity in urban dwellers.
- Age structure : > 65 Vs 45-65 yrs.

Global Scenario

- **422 million(2016)** people worldwide have diabetes.
- In 2012, an estimated **1.5 million** people died from consequences of high fasting blood sugar.
- More than **80%** of diabetes deaths occur in low- and middle-income countries.
  - In developed countries most people with diabetes are above the age of retirement, whereas in developing countries those most frequently affected are aged between 35 and 64.
- WHO projects that diabetes will be the 7th leading cause of death in 2030.
  - Total deaths from diabetes are projected to rise by more

India

- India has the unfortunate privilege of being the "***Diabetes capital***" of the world.
- More concerning is the fact that diabetes prevalence

- ***Urban:10.9-14.2,*** ***Rural:3.0-8.3***
- Another interesting phenomena is that Indians who ***migrate to affluent countries develop very high prevalence rates of 10 to 20%.***

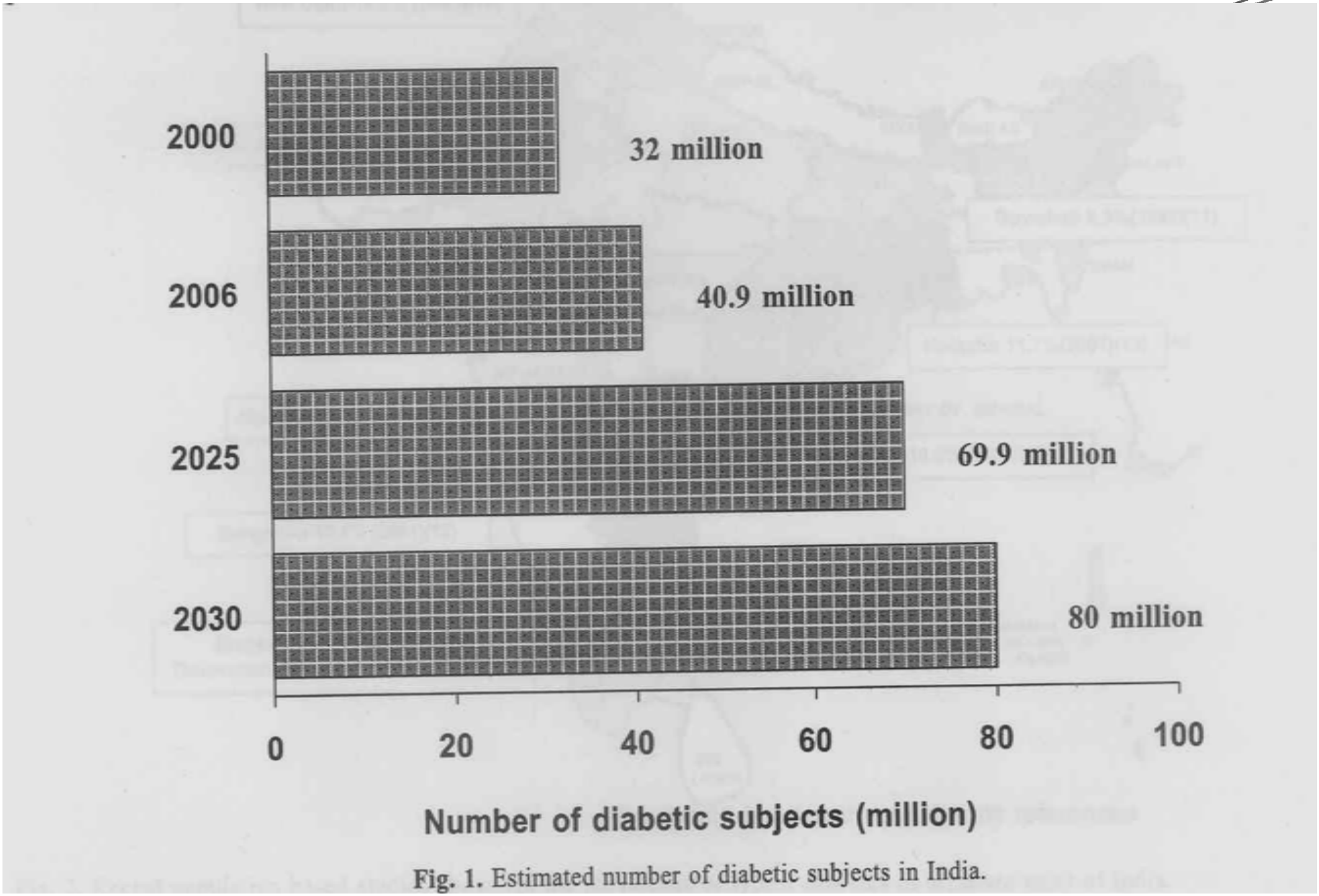

Fig. 1. Estimated number of diabetic subjects in India.

Prevalence of T2DM in India

Year	Area	Urban	Rural
1971	Central	1.2	-
1972	North	2.3	-
1979	Multicenter	3.0	1.3
1984	South	4.7	-
1986	West	3.8	-
1989	South	-	1.6
1992	South	8.2	2.4
1997	South	11.6	-
2000	National	12.1	-
2006	South	19.5	-
2006	National	5.6	7.27

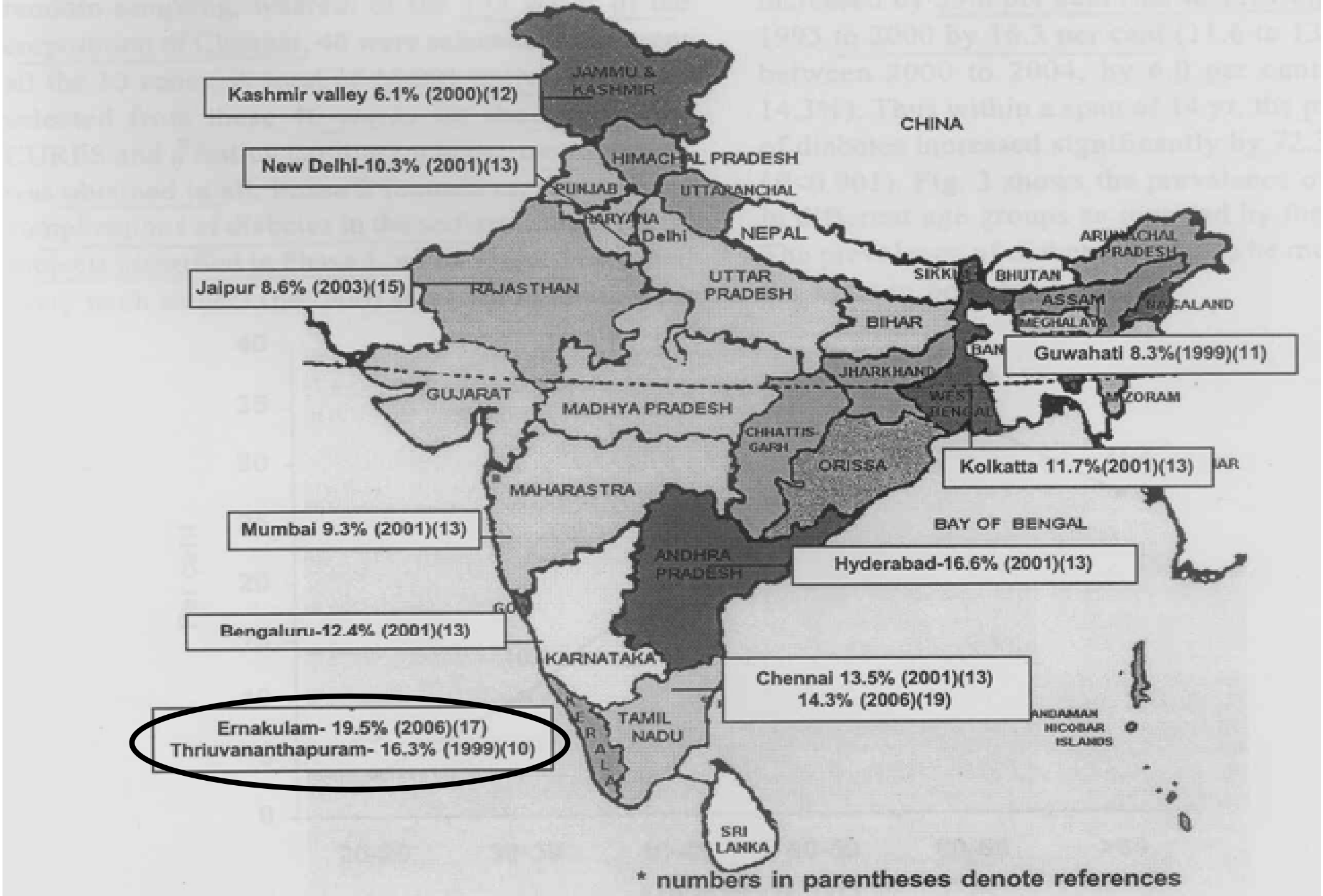

Fig. 2. Recent population based studies showings the prevalence of type 2 diabetes in different parts of India.

Diabetes in Indians

- Increasing prevalence in urban population
- Occurs at younger age
  - 54% had diabetes before the age of 50 yrs.
  - ***563 Newly detected DM at PGI – 45.6% below 50 yr.***
- Prevalence of IGT is higher than DM
  - 14% vs 12.1%
- Undiagnosed DM is more than known DM
  - 9.1% vs 6.1%
- Majority of patients are ***non-obese but centrally obese***

Type 1 diabetes

- Previously known as ***insulin-dependent***, juvenile or childhood-onset
- ***Deficient insulin production*** and requires daily administration of insulin.
- The cause of type 1 diabetes is not known and it is ***not preventable with current knowledge.***

Type 2 diabetes

- Formerly called non-insulin-dependent or adult-onset
- Results from the ***body's ineffective use of insulin.***
- Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely the result of ***excess body weight and physical inactivity.***
- Until recently, this type of diabetes was seen only in adults but it is ***now also occurring in children***.

Gestational diabetes

- Gestational diabetes is hyperglycaemia with onset or ***first recognition during pregnancy***.

Impaired Glucose Tolerance (IGT) and impaired Fasting Glycaemia (IFG)

- Intermediate conditions in the ***transition between normality and diabetes.***
- People with IGT or IFG are at ***high risk of progressing to type 2 diabetes, although this is not inevitable.***

- Before people develop type 2 diabetes, they almost always have *"**prediabetes**"* — blood glucose levels that are higher than normal but not yet high enough to be diagnosed as diabetes.

- Recent research has shown that ***some long-term damage to the body, especially the heart and circulatory system,*** may already be occurring during prediabetes.

- The good news is there are things you can do to ***prevent or delay the development of type 2 diabetes.***

People with prediabetes often don’t have symptoms.

- In fact, millions of people have diabetes and don't know it because **symptoms develop so gradually**, people often don't recognize them. Some people have. ***no symptoms at all***Symptoms of diabetes include:

- unusual thirst
- frequent urination
- blurred vision
- extreme fatigue
- frequent infections
- cuts/bruises that are slow to heal
- tingling/numbness in the hands/feet
- recurring skin, gum or bladder infections

How is diabetes diagnosed?

- **Fasting Plasma Glucose (FPG)**

➢ Fasting means after not having anything to eat or drink (except water) for ***at least 8 hours before the test***.

- **Random (also called Casual) Plasma Glucose Test**

➢ Checks blood glucose levels at **any time of the day**.

- **Glycosylated Hb A1C**

➢ The A1C test measures average blood glucose for the ***past 2 to 3 months.***

- **Oral Glucose Tolerance Test (OGTT)**

➢ Checks blood glucose levels before and 2 hours after patient ***drink a special sweet drink***.

Test	IGT	Diabetes
Fasting Plasma Glucose	100 125 mg/dl	≥ 126 mg/dl
Random Plasma Glucose	140 – 199 mg/dl	≥ 200 mg/dl
A1C	5.7% – 6.4%	≥ 6.5%

Evidence	Decreased risk	Increased risk
Convincing	Voluntary weight loss in overweight and obese people Physical activity	Overweight and obesity Abdominal obesity Physical inactivity Maternal diabetes[a]
Probable	NSP[1]	Saturated fats Intrauterine growth retardation
Possible	η-3 fatty acids Low glycaemic index foods Exclusive breast-feeding[b]	Total fat intake Trans-fatty acids
Insufficient	Vitamin E Chromium Magnesium Moderate alcohol	Excess alcohol

1 NSP = non-starch polysaccharides.
a Includes gestational diabetes.
b As a global public health recommendation, infants should be exclusively breast-fed for the first six months of life to achieve optimal growth, development and health *(59)*.

Determinants - Risk Factors for Diabetes

- **Non Modifiable; and**
- **Modifiable.**

- The two most important determinants of diabetes are ***firstly, genetic background (family history) and secondly, obesity***.
- It has been very aptly said that for diabetes, "***genetics loads the cannon and obesity finally fires it***".

Non Modifiable risk factors

- Genetic
- Age
- Sex
- Racial factors:
  - South Asian populations including Indians may be at high risk.
  - One hypothesis is that this may be due to the effect of ***"thrifty genes"***. ***These genes developed as a part of nature's protective*** **mechanisms, among populations who were for many centuries exposed to starvation, famines and lack of food.** However, with economic improvements in such populations, the food supply improves greatly but the protective effect of thrifty gene also continues resulting into ***excessive levels of obesity and consequent diabetes.***

Modifiable risk factors

- Obesity
- Physical activity
- Nutritional factors
  - Glycaemic index
- Stress
- Drugs
- Infections etc.

Common consequences of diabetes

- Increases the ***risk of heart disease and stroke***.
  - 50%-80% of people with diabetes die of cardiovascular disease
- Combined with reduced blood flow, ***neuropathy (nerve damage) in the feet increases the chance of foot ulcers***, infection and eventual need for limb amputation.
- ***Diabetic retinopathy*** is an important cause of blindness.
  - One percent of global blindness can be attributed to diabetes.
- ***Diabetes is among the leading causes of kidney failure.***
- The overall risk of dying among people with diabetes is *at least double the risk of their peers without diabetes.*

Screening for Diabetes

- Urine examination for sugar:
  - Low sensitivity, High specificity
- Blood sugar:
  - FBG, RBG, OGTT
- High risk groups for screening:
  - 40 years & above
  - Family history of DM
  - Obese
  - GDM
  - Women who have had a baby weighing > 4kg
  - Patients with premature atherosclerosis

Indian Diabetes Risk Score (IDRS)

Age (Years)	
<35	0
35-49	20
50 & above	30
Waist circumference (cms): F , M	
<80, <90	0
80-89, 90-99	10
90 & above, 100 & above	20
Physical activity	
Regular vigorous exercise or strenuous activity	0
Regular moderate exercise or activity	10
Regular mild exercise or activity	20
No exercise and/or sedentary activity	30
Family history of DM	
No	0
One parent is diabetic	10
Both parents are diabetic	20

High risk >60; Moderate risk 30-60; Low risk <30

Prevention & Care

- Primary prevention
- Secondary prevention
- Tertiary prevention

Primary prevention

- Population strategy
- High risk strategy

- Simple lifestyle measures have been shown to be effective in preventing or delaying the onset of type 2 diabetes.

➢ Achieve and maintain healthy body weight;

➢ Be physically active – at least 30 minutes of regular, moderate-intensity activity on most days;

➢ Eat a healthy diet of between three and five servings of fruit and vegetables a day and reduce sugar and saturated fats intake;

➢ Avoid tobacco use – smoking increases the risk of cardiovascular diseases.

Secondary prevention

- Early diagnosis can be accomplished through relatively inexpensive blood testing.
- Treatment of diabetes involves lowering blood glucose and the levels of other known risk factors that damage blood vessels.
  - People with type 1 diabetes require insulin;
  - People with type 2 diabetes can be treated with oral medication, but may also require insulin
- Self care
- Home based glucose monitoring

- Interventions that are both ***cost saving and feasible*** in developing countries include:
  - moderate blood glucose control;
  - blood pressure control;
  - foot care.
- **Other cost saving interventions** include:
  - screening and treatment for retinopathy;
  - blood lipid control;
  - screening for early signs of diabetes-related kidney disease.
- These measures should be ***supported*** by a healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use.

Tertiary prevention

- Diabetic clinics

Educate about

- Do not miss the antidiabetic medicines
- Do not miss the meals
- Diabetic identification card
- Carry some sugar or lozenges for any hypoglycaemic emergency
- Foot care, footwear and daily inspection
- Early identification of complications
- Regular Physical exercise, Diet, No Tobacco, Avoid alcohol

Do's

- Barley is good for use as a principal ingredient.
- Shilajit (Black bitumen), Jaamun *(Syzygium cumini), Haldi (Curcuma longa), Amla (Emblica officinalis),* Guduchi (Tinospora cordifolia), Methi *(Trigonella foenumgracum), Karela (Momordia charantia), Neem (Azadriacta indica), Chirayata (Swertia chirayita), Bael Fruit (Aegle marmelos),* mesesrngi *(Gymnema sylvestre) etc. are useful in this condition.*
- Karela *(Momordica charantia) and 20-30 ml juice of white* pumpkin *(Cucurbita Pepo) should be taken on an empty* stomach.
- Methi *(Trigonella foenumgracum) seeds water soaked over night* is also useful in this disease
- 2 gms. of Jaamun *(Syzygium cumini) seeds per day*

Dont’s

- Sugar, Sugar products, rice, potato, ghee, butter, fat, oil, fermented food items, alcohol, and other heavy food items are to be avoided.
- Restrain sedentary life style.

Components of the direct and indirect costs of diabetes mellitus

Direct costs	Indirect costs	Intangibles
Hospitalization	Premature mortality	Pain
Emergency care	Premature morbidity	Personal costs
Physician's services	Loss of working days Loss of leisure time	Insurance
Long – term care surgery	Regular activity foregone	Family disruption and suffering
Laboratory tests		Income assistance
Drugs equipment		

Foods you should eat more often

- Take a balanced Diet.
- All green and leafy vegetables like Bittergourd, Lettuce leaves, Brinjals, Ladies finger, Cabbage, Cauliflower, Carrot, Soya beans, Drumstick are good.
- Cook the vegetables with minimum oil.

Foods you should avoid

- Sugar in any form-Sweets, Ice creams, Chocolates, Candies etc ,
- High carbohydrate foods like Potatoes, Sweet potatoes etc.,
- Fried items like Puri and Chat items
- Fruits high in sugar content like Banana, Sapota, Grapes, Mango etc

How does Exercise help ?

- Lowers blood glucose levels quickly
- Improves the body s ability to use insulin
- Reduces insulin requirement
- Better control of Diabetes
- Reduces the risk of heart disease

Thanks…