Diabetes – a BIG problem

By 2040, 1 adult in 10 (642 million) will have diabetes

Epidemiology

1 in 11 adults have diabetes (415 million)

46.5% of adults with diabetes are undiagnosed

By 2040, 1 adult in 10 (642 million) will have diabetes

Diabetes mellitus

• Diabetes mellitus is a chronic disease which has been described as a state of raised blood glucose (hyperglycaemia) associated with premature mortality.

• Diabetes arises when:
  – the beta cells in the pancreas fail to produce enough of the hormone insulin – T1DM
  – or when the body cannot effectively use the produced insulin – T2DM

• Hyperglycaemia seriously damages many of the body’s systems, especially the blood vessels and nerves.

Classification of Diabetes

• Type 1 diabetes
  – β-cell destruction

• Type 2 diabetes
  – Progressive insulin secretory defect

• Other specific types of diabetes
  – Genetic defects in β-cell function, insulin action
  – Diseases of the exocrine pancreas
  – Drug- or chemical-induced

• Gestational diabetes mellitus

Types of Diabetes

• Type 1 (T1DM, DM1)
  – onset in youth, destruction of beta cells and a requirement for insulin

• Type 2 (T2DM, DM2)
  – onset as adult or young adult, related to insulin resistance. May be treated with lifestyle modification, oral medications, and later may require insulin
**T1DM versus T2DM**

<table>
<thead>
<tr>
<th>Type 1 Diabetes</th>
<th>Type 2 Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin is always needed</td>
<td>May need Oral medication or Oral medication plus insulin or Insulin alone</td>
</tr>
</tbody>
</table>

**Diabetes Medications**

**Main symptoms of diabetes**

- feeling very thirsty
- going to the toilet a lot, especially at night
- extreme tiredness
  - Frequent urination
  - Excessive thirst
  - Unexplained weight loss
  - Extreme hunger
  - Sudden vision changes
  - Tingling or numbness in the hands or feet
  - Feeling very tired much of the time
  - Very dry skin
  - Sores that are slow to heal
  - More infections than usual

**Diabetes – cardinal symptoms**

**CARDINAL SYMPTOMS**

- Polyuria
- Polydipsia
- Weight loss
- Frequent urination
- Excessive thirst
- Unexplained weight loss
- Extreme hunger
- Sudden vision changes
- Tingling or numbness in the hands or feet
- Feeling very tired much of the time
- Very dry skin
- Sores that are slow to heal
- More infections than usual

**OTHER COMMON SYMPTOMS**

- Lethargy and weakness
- White patches in the mouth/oropharynx with difficulty in swallowing (candidiasis)
- White vaginal discharge
- Recurrent skin infections
- Dry, scaly skin
- Delayed wound healing
- Palpitation & breathlessness
- Claudication
- Dizziness on standing
- Sudden loss of consciousness
- Nummular tingling/pain in the extremities
- Carpal tunnel syndrome
- Recurrent nausea and vomiting
- Diarrhoea/constipation
- Urinary incontinence
- Erectile dysfunction
- Blurred vision/floaters/sudden loss of vision and diplopia
- Dorsal and side flexions/limbs

**Diabetic Ketoacidosis**

**B- Physical signs of DKA:**

a. General signs: ill appearance and disturbed consciousness.

b. Signs of dehydration:
   - Skin: Dry, hot, flushed, and loss of skin turgor.
   - Tongue: Dry (sometimes woody tongue).
   - Eyes: Sunken eyes and dark circles under the eyes.

c. Vital signs:
   - Tachycardia, hypotension and tachypnea.

d. Specific signs:
   - Ketotic breath: A strong, fruity breath odour (similar to nail polish remover or acetone).
   - Acidotic breath (Kussmaul’s respiration): deep and rapid.
   - Abdominal tenderness.

**GENERAL ASSESSMENT**

**PATIENTS WITH ALTERED CONSCIOUSNESS**

MUST CHECK FOR:

- Mental state
- Pulse
- Blood pressure
- Respiration
- State of hydration

**In the non-acute setting, in addition to the above parameters, measurement of BMI and waist to hip ratio is of great importance. Orthostatic BP should also be measured.**

**Kussmaul Breathing**

Loss of skin turgor: indicative of dehydration.
LOCOREGIONAL EXAMINATION

DIABETES CAN AFFECT ALMOST EVERY SYSTEM OF THE BODY. SO A PATIENT SUSPECTED OF HAVING DIABETES SHOULD BE EXAMINED THOROUGHLY FROM HEAD TO TOE.

EXAMINATION OF HEAD AND NECK
- XANTHELASMA
- CRANIAL NERVE PALSIES (III, IV, VI AND VII)
- EYE MOVEMENTS
- PTOSIS
- HERNIATION
- CAROTID PULSE
- CAROTID BRUIT
- THYROID ENLARGEMENT

EXAMINATION OF BUCCAL CAVITY

INSPECTION
ONE MUST LOOK FOR
- PUFFY RED GUMS
- A BUILD UP OF PLAQUE
- OBVIOUSLY DECAYED TEETH
- TYPICAL BAD BREATH OF PERIODONTITIS

A COMPLETE DENTAL EXAMINATION, INCLUDING PERIODONTAL PROBING OF GUM POCKETS, IS NECESSARY TO DETERMINE THE PRESENCE AND SEVERITY OF PERIODONTAL INFECTION.

EXAMINATION OF SKIN AND NAIL

NEVUShyperpigmentation
LEPRA nodules
AUGMENTED NEVUS (OVARIAN)
ACANTHOSIS NIGRICANS (OVARIAN)
NICKED BURNT NAIL
NAIL THEFT
FUNGAL NAIL INFECTIONS

EXAMINATION OF INJECTION SITES

AREAS TO BE EXAMINED ARE
- ANTERIOR ABDOMINAL WALL
- UPPER THIGH/JOINTS
- UPPER OUTERM ARM

POSSIBLE FINDINGS
- BRUISING
- LIPODYSTROPHY
- LIPOMYELATROPHY
- LIPOMYELATROPHY

EXAMINATION OF ABDOMEN

POSSIBLE FINDINGS
- HEPATOMEGALY (due to NON-ALCOHOLIC FATTY LIVER DISEASE)
- ABDOMINAL TENDERNESS (in DKA)

EXAMINATION OF LEGS

POSSIBLE FINDINGS
- GAIT AND THIGH MUSCLE WASTING
- SENSORY ABNORMALITY
- DRY SKIN AND HAIR LOSS
- ABSENT/WEAK FEMORAL PULSE
- FEMORAL BRUIT
- LOSS OF KNEE/ANKLE JERKS

EXAMINATION OF FEET

INSPECTION
- DEFORMITY LIKE CHARCOT NEUROARTHRITIS/CLAW TOE
- CALLUS
- LOSS OF PLANTAR ARCH
- DIABETIC FOOT ULCER
- DISCOLOURATION OF SKIN (DUE TO ISCHAEMIA)
- FUNGAL INFECTIONS

CHARCOT NEUROARTHRITIS
CLAW TOE
DIABETIC FOOT ULCER
Criteria for the Diagnosis of Diabetes

- A1C ≥6.5%
- OR
- Fasting plasma glucose (FPG) ≥126 mg/dL (7.0 mmol/L)
- OR
- 2-h plasma glucose ≥200 mg/dL (11.1 mmol/L) during an OGTT
- OR
- A random plasma glucose ≥200 mg/dL (11.1 mmol/L)

Prediabetes: IFG, IGT, Increased A1C

<table>
<thead>
<tr>
<th>Categories of increased risk for diabetes (prediabetes)*</th>
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<tbody>
<tr>
<td><strong>IMPAIRED FASTING GLUCOSE</strong></td>
</tr>
<tr>
<td>FPG 100–125 mg/dL (5.6–6.9 mmol/L)</td>
</tr>
<tr>
<td><strong>IMPAIRED GLUCOSE TOLERANCE</strong></td>
</tr>
<tr>
<td>2-h plasma glucose in the 75-g OGTT 140–189 mg/dL (7.8–11.0 mmol/L):</td>
</tr>
<tr>
<td><strong>PREDIABETES</strong></td>
</tr>
<tr>
<td>A1C 5.7–6.4%</td>
</tr>
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</table>

*For all three tests, risk is continuous, extending below the lower limit of a range and becoming disproportionately greater at higher ends of the range.

Risk factors

- Physical inactivity
- First degree relative with diabetes
- High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
- Women who delivered a baby weighing >9 lb or were diagnosed with GDM
- Hypertension (≥140/90 mmHg or on therapy for hypertension)
- HDL cholesterol level <35 mg/dL (0.90 mmol/L) and/or a triglyceride level >250 mg/dL (2.82 mmol/L)
- Women with polycystic ovarian syndrome (PCOS)
- A1C ≥5.7%, IGT, or IFG on previous testing
- Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
- History of CVD

Complications at the time of T2DM diagnosis

- 50% patients have 1 or more diabetic complications at the time of diagnosis
- Ischaemic skin changes to foot: 6%
- Hypertension: 35%
- Retinopathy: 21%
- Erectile dysfunction: 20%
- Intermittent claudication: 3%
- Abnormal ECG: 18%
- Plasma creatinine >120 μmol/L: 3%
- Absent foot pulses: 13%
- Stroke or TIA: 1%
- Myocardial Infarction: 1%
**HYPO**

<table>
<thead>
<tr>
<th>Early adrenergic symptoms</th>
<th>Neuroglyopenic signs</th>
</tr>
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<tbody>
<tr>
<td>Pallor</td>
<td>Confusion</td>
</tr>
<tr>
<td>Diaphoresis</td>
<td>Slurred speech</td>
</tr>
<tr>
<td>Shaking</td>
<td>Irrational or uncontrolled behavior</td>
</tr>
<tr>
<td>Hunger</td>
<td>Disorientation</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Loss of consciousness</td>
</tr>
<tr>
<td>Irritability</td>
<td>Seizures</td>
</tr>
<tr>
<td>Headache</td>
<td>Papillary sluggishness</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Decreased response to noxious stimuli</td>
</tr>
</tbody>
</table>

**Risk of hypoglycemia**

- Coma
- Increased risk of car accident
- Loss of consciousness
- Hospitalisation costs
- Cardiovascular complications
- Weight gain by defensive eating
- Increased risk of seizures
- Increased risk of dementia
- Reduced quality of life
- Increased risk of car accidents
- Coma
- Death

**Hypoglycaemia**

**Low Blood Sugar Symptoms**

- Shaking
- Sweating
- Annoyed
- Dizziness
- Hungry
- Fast heart beat
- Impaired vision
- Weakness
- Irritable
- Nausea

**Definition**

Constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus.

**Alternative names:**
- Metabolic syndrome
- Syndrome X
- Insulin resistance syndrome
- Deadly quartet
- Reaven's syndrome
Global cardiometabolic risk

Features of metabolic syndrome

The major features of metabolic syndrome include:

- Central obesity
- Hypertriglyceridemia
- Low high density lipoprotein (HDL)
- Hyperglycemia
- Hypertension

Epidemiology

- Prevalence increases with:
  - Age
  - greater industrialization and urbanization

- Increase in waist circumference is found predominantly in women.
  - Fasting TG>150 mg/dl and hypertension more likely in men.

Risk factors

- Overweight/obesity — central type (key feature)
- Sedentary lifestyle
  - Predictor of CV events and associated mortality
  - Associated with central obesity, ↑ TG, ↓ HDL, ↑ BP, ↑ glucose intolerance
- Aging — prevalence increases with age
- Diabetes mellitus — approx. 75% of T2DM or IGT have metabolic syndrome
- Coronary heart disease — 50% of CHD patients have metabolic syndrome
- About 1/3rd of MS patients have premature CAD
- Lipodystrophy — both genetic or acquired have severe insulin resistance

Clinical features

- Usually asymptomatic and a high index of suspicion is needed for diagnosis

- Examination
  - Increased waist circumference
  - Increased Blood Pressure
  - Lipoatrophy
  - Acanthosis nigricans / skin tags

Should alert to search for other abnormalities

Obesity

- Definition: excessive weight that may impair health

- How do we measure if someone is obese?
  - Body Mass Index (BMI) = \( \frac{\text{weight}}{\text{height}^2} \)
  - BMI is calculated from your height and weight.

- Normal weight
  - 18.5–24.9
- Overweight
  - 25.0–29.9
- Obese
  - 30.0–39.9
- Extreme obesity
  - 40.0 and above
**Cause of Obesity**

- Simple equation...when you eat more than you use...it is stored in your body as “fat”.
  
  -- Causes
  
  - Global shift in how we eat
  - Western diet of processed food
  - Higher sugar, fat and calories in what we eat
  - Less nutrients
  - Reduced intake of vitamins and minerals

**How is body fat measured?**

- BMI
- Waist circumference
- Underwater weighing (hydrostatic weighing):
- BOD POD
- Dual-energy X-ray absorptiometry (DEXA)
- Skin calipers
- Bioelectric impedance analysis (BIA)

**What Are the Signs and Symptoms**

- Weight gain usually **happens over time**. Most people know when they've gained weight. Some of the signs of overweight or obesity include:

  - Clothes feeling tight and needing a larger size.
  - The scale showing that you've gained weight.
  - Having extra fat around the waist.
  - A higher than normal body mass index and waist circumference.
### BOD POD

The BOD POD is a computerized, egg-shaped chamber. Using the same whole-body measurement principle as hydrostatic weighing, the BOD POD measures a subject's mass and volume, from which their whole-body density is determined. Using this data, body fat and lean muscle mass can then be calculated.

### Skin calipers

### Bioelectric impedance analysis (BIA)

Set-up shown is typical of impedimed devices intended for estimation of whole body composition.

### Diagnostic criteria 2009


3 from 5 risk factors

- Diabetes or IGT
  - Fasting plasma glucose ≥100 mg/dl or specific medication
- Obesity
  - Higher risk: waist circumference ≥ 94 cm in males ≥ 80 cm in females
  - High risk: waist circumference ≥ 102 cm in males ≥ 88 cm in females
- Dyslipidemia
  - Hypertriglyceridemia: ≥150 TG's or specific medication
  - Low HDL cholesterol: <40(M) and <50(F) or specific medication
- Hypertension
  - Systolic blood pressure ≥130 mm or diastolic BP ≥85 mm, or specific medication
- Other risk factors
  - Inflammation
  - Disorders of the hemostasis

### Hyperlipidemia

- Eruptive xanthoma
- Arcus lipoides cornae

### Obesity and health problems

Obesity can cause day-to-day health problems such as:

- breathlessness
- increased sweating
- snoring
- inability to cope with sudden physical activity
- feeling very tired every day
- back and joint pains
- low confidence and self esteem
- feeling isolated
Thank You!