Diagnosis, classification and prevention of diabetes

Section 1 | 1 of 4

Curriculum Module II–1 | Diagnosis, classification and presentation of diabetes

Slides current until 2008
Definition of diabetes

Characterized by hyperglycaemia

• Defects in insulin production
• Autoimmune or other destruction of beta cells
• Insulin insensitivity
• Impaired action of insulin on target tissues
Definition of diabetes

Chronic hyperglycaemia associated with long-term damage to:

- Eyes
- Kidneys
- Nerves
- Heart and blood vessels
The diabetes epidemic

- 230 million affected in 2006
- 350 million within 20 years
- Most rapid in Indian and Asian subcontinents
Classification

- Type 1 diabetes
  - autoimmune
  - LADA
  - idiopathic
- Type 2 diabetes
Classification

Other specific types

- MODY
- Defects in insulin action
- Diseases of the pancreas
- Endocrine disorders
- Drug- or chemical-induced
- Infections
Classification

- Uncommon forms of immune-mediated diabetes
- Other genetic syndromes
- Gestational diabetes
Insulin and glucose disposal

- Insulin
- Glucose uptake
- Glycogen synthesis
- Blood glucose
- Gluconeogenesis
- Glycogenolysis
- Glycogen synthesis
- Glucose uptake
- Free fatty acid release
Insulin deficiency in type 1 diabetes

- Glucose uptake
- Glycogenolysis
- Gluconeogenesis (amino acids)
- Ketone production (fatty acids)

**Blood glucose**

- Glucose uptake
- Protein degradation → amino acids

- Triglyceride degradation → fatty acids
Insulin insensitivity in type 2 diabetes

- Glucose uptake
- Glycolysis
- Gluconeogenesis (amino acids)

Blood glucose

- Glucose uptake
- Protein degradation → amino acids
Diagnosis and types
Curriculum Module II-1
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Pathogenesis of type 1 diabetes

- Genetic abnormalities
- Pre-diabetes
- Clinical diabetes
- ‘Honeymoon’
- Chronic phase

Time (months - years)
Idiopathic type 1 diabetes

Non-autoimmune type 1 diabetes

- No autoimmune markers
- Permanent insulinopenia
- Ketoacidosis
- People of African and Asian origin
Epidemiology of type 1 diabetes

- Age of onset peaks
  - preschool
  - puberty
- Autumn/winter peaks
Type 2 diabetes

- 90%-95% of people with diabetes
- Insulin insensitivity and relative insulin deficiency
- Obesity or overweight
- Complications often present at diagnosis
Pathogenesis of type 2 diabetes

- Multiple genes involved
- Hyperinsulinaemia
- Poor fetal nutrition → ↓ beta-cell formation
- Low birth weight/weight change
- "Thrifty gene"
The natural history of type 2 diabetes

- Beta-cell loss
- Primary failure
- ↑ Insulin requirements with age
- Endogenous insulin

Age (years)

Insulin requirements
Epidemiology of type 2 diabetes

- Dramatic increase
- Aging population
- Disturbing trends parallel obesity epidemic
- Especially in adolescents and minority groups
- Increasing in young people
ACTIVITY

• What are the most common risk factors for type 2 diabetes for people in your country?

• Are any of these risk factors modifiable?
Risk factors for type 2 diabetes

- Age $\geq$ 40 years
- First-degree relative with diabetes
- Member of high risk population
- History of impaired glucose tolerance, impaired fasting glucose
- Vascular disease
- History of gestational diabetes
- History of delivery of macrosomic baby
Risk factors for type 2 diabetes

• Hypertension
• Dyslipidaemia
• Abdominal obesity
• Overweight
• Polycystic ovary disease
• Acanthosis nigricans
• Schizophrenia
Signs and symptoms

- Polydipsia
- Polyuria
- Nocturia
- Visual disturbance
- Fatigue
- Weight loss
- Infections
## Diagnosing diabetes

<table>
<thead>
<tr>
<th>Condition</th>
<th>FPG &lt; 6.1mmol/L</th>
<th>2hr PG &lt; 7.8mmol/L</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Impaired fasting glucose*</td>
<td>7.8 to 11mmol/L**</td>
<td>≥7.0mmol/L</td>
</tr>
<tr>
<td></td>
<td>Impaired glucose tolerance**</td>
<td></td>
<td>≥11.1mmol/L</td>
</tr>
<tr>
<td>Impaired fasting glucose*</td>
<td>[5.6] 6.1 to 6.9mmol/L*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Slides current until 2008
Diagnosis of Diabetes

- Symptoms + gluc > 11.0 mmol/l
- 2X FG > 6.9 mmol/l
- 2X 2hr GTT > 11.0 mmol/l
Impaired glucose tolerance
Impaired fasting glucose

- Intermediate states
- Increased risk of developing diabetes
- Prevention strategies to prevent or delay progression
- Increased risk of cardiovascular disease
Prevention of type 1 diabetes

Insulin

• Diabetes Prevention Trial

• Diabetes Prediction and Prevention Project
Prevention of type 2 diabetes

Lifestyle modification

• Da Qing Study

• Finnish Diabetes Prevention Study
Prevention of type 2 diabetes

Lifestyle vs medication

- Diabetes Prevention Program
- STOP-NIDDM
Type 2 diabetes can be delayed in people with IGT

Lifestyle modification is most effective

What do you think could be done at community level to prevent or delay diabetes?
Summary

Type 1 diabetes

• Results from progressive beta-cell destruction

• People with type 1 diabetes need insulin therapy to live
Summary

Type 2 diabetes

- Often characterized by insulin insensitivity and relative rather than absolute insulin deficiency
- A progressive condition
- Most people with type 2 diabetes will need insulin within 5 to 10 years of diagnosis
References


References


**References**

