Why Diabetes Matters

Rob Andrews

1. Diabetes is common and on the increase
2. Diabetes can be prevented
3. Diabetes has unpleasant complications
4. Complications are largely preventable

Secular trends in incidence rates, age 0-14 yrs.

Age-Specific Prevalence of Diabetes in the USA (mainly type 2)

For every known case of diabetes, there is another that is undiagnosed
Factors Influencing Prevalence of type 2 diabetes

- Age
- Ethnicity
- Obesity
- Family history
- Birth weight
- Lifestyle

Ethnicity:
- Special populations (Pima Indians, Nauru)
- Indian Subcontinent
- Indo-Americans
- Black African descent
- European descent

Diabetes in Nauru

- Traditional lifestyle based on agriculture and fishing
- 1906: guano discovered
- 1925: first case of diabetes
- 1934: second case of diabetes
- 1968: per capita royalties $22,500

Prevalence of diabetes

- 1/3 over age 20
- 2/3 over age 55
- 77% over age 70
Factors Influencing Prevalence of type 2 diabetes

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Factors Influencing Prevalence of type 2 diabetes

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Birth wt and IR

Exercise and risk of Diabetes

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Prevention of Type 2 diabetes

Insulin secretion

Insulin resistance

Normal

IGT

Diabetes

Prevention IGT \rightarrow Diabetes

2 major studies

- **Finnish prevention trial (522)**
  - Normal vs Lifestyle intervention

- **American prevention trial (3234)**
  - Normal vs Lifestyle intervention vs metformin

**Intervention in both studies**

**Aims**

- Reduce weight by 5% or more
- Reduce total fat < 30%
- Reduce intake of sat fat < 10%
- Increase fibre to > 15g/1000 Kcal
- Moderate exercise for 30 min per day

**Finnish prevention trial**

\[\text{% diabetes free vs Years} \]

**American prevention trial**

\[\text{% Incidence of diabetes vs Years follow up} \]

**Finnish prevention trial**

\[\text{Incidence of diabetes vs Number goals} \]
**Summary prevention trials**

*Summary*
- Diet and exercise (D+E) reduces progression to diabetes by 58%
- Metformin reduces risk but not as much as D+E
- The more changes in D+E made the greater the effect
- 22 patients with IGT need to be treated with D+E for 1 year to prevent one person getting diabetes

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**Bariatric surgery**

- **Lap RYGB = Roux en Y Gastric Bypass**
- **Adjustable gastric band**

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**Longer term data**

![Graph showing weight loss over time for Gastric Band and RYGB operations](image)

*Figure 4: Systematic review of the weight loss achieved in the medium term (3-10 years) for the principal bariatric surgery procedures of gastric banding, gastric bypass (RYGB) and biliopancreatic diversion*

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**What happens if you don’t operate**

<table>
<thead>
<tr>
<th></th>
<th>Operation</th>
<th>No operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of dying</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>New cancer diagnosis</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td>Heart problems</td>
<td>5%</td>
<td>27%</td>
</tr>
<tr>
<td>New onset diabetes</td>
<td>0%</td>
<td>27%</td>
</tr>
<tr>
<td>Significant infections</td>
<td>9%</td>
<td>37%</td>
</tr>
<tr>
<td>Arthritis</td>
<td>5%</td>
<td>12%</td>
</tr>
<tr>
<td>Respiratory problems</td>
<td>3%</td>
<td>11%</td>
</tr>
<tr>
<td>Time in hospital</td>
<td>21 days</td>
<td>36 days</td>
</tr>
</tbody>
</table>

5-year follow up 6,000 patients average BMI 50 Christou 2004

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**Complications of Diabetes**

- **Acute**
- **Chronic**
Acute complications of diabetes

• Hyperglycaemic Ketotic and non-ketotic
• Hypoglycaemia (complication of treatment) Insulin and sulfonylureas
• Infections Atypical or fulminant
• Acute intercurrent illness e.g. Myocardial infarction

Chronic complications of diabetes

• Microvascular Retinopathy, nephropathy
• Macrovascular Heart disease, stroke, peripheral vascular disease
• "Metabolic" Neuropathy, cataracts

Microvascular Complications

Small vessels become thicker and more leaky

Diabetes is the commonest cause of blindness in people of working age
Diabetes is the commonest cause of referral for renal transplantation

Macrovascular Complications

• Coronary risk X 2-3
• Stroke X 2-3
• Amputation X 5-10
Coronary Mortality, Men in the UK

CHD 26%  CHD 66%

Other

Non-diabetic

Diabetes

Risk factors are additive

Impact of multiple risk factors in the presence of diabetes

Number of risk factors:
- Non-smoking
- High cholesterol
- Hypertension

CHD 26%  CHD 66%

Other

Other

Risk factors are additive

Coronary Mortality, Men in the UK

Coronary Mortality is Falling in the Population as a Whole

The risk of a first coronary in someone with diabetes is equivalent to the risk in a non-diabetic who has already had a coronary.

Lawlor et al, BMJ, 2001

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Microvascular complications

**HbA1c Dependent**
- Not in IGT
- Type 2 at diagnosis
- Type 1 5-15 years after diagnosis

**Retinopathy**
- 100% type 1 patient get

**Neuropathy**
- Increase with time
- 70-100% get

**Nephropathy**
- 30-40% less in type 2 diabetes

- Microalbuminuria (25-250mg/dl)
- Macroalbuminuria (>250mg/dl)
- CRF

Macrovascular complications

**HbA1c independent**
- Present in IGT
- Metformin seems to reduce risk

**Hypertension**
- Blood pressure
  - Aim for 135/80

**Microalbuminuria**

**Insulin concentration**
- role insulin sensitizers

**Weight**

Complications are Largely Preventable

- The prognosis of type 1 diabetes continues to improve dramatically, when modern techniques of management are applied.