THE GLOBAL BURDEN OF DIABETES

World Health Organization
Geneva
Switzerland
Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications

Report of a WHO Consultation

Part 1: Diagnosis and Classification of Diabetes Mellitus

World Health Organization
Department of Noncommunicable Disease Surveillance
Geneva
Values for diagnosis of diabetes mellitus and other categories of hyperglycaemia (WHO, 1999)

Venous plasma glucose concentration, mmol/l

**Diabetes mellitus:**
Fasting **or**
2-h post 75g glucose load

>= 7.0  **(126 mg/dl)**
>= 11.1  **(200 mg/dl)**

**Impaired Glucose Tolerance (IGT):**
Fasting (if measured) **and**
2-h post 75g glucose load

< 7.0  **(126 mg/dl)**
>= 7.8 and < 11.1  **(140 mg/dl and 200 mg/dl)**

**Impaired Fasting Glycaemia (IFG):**
Fasting
and (if measured)
2-h post 75 glucose load

>= 6.1 and < 7.0  **(110 mg/dl and 126 mg/dl)**
< 7.8  **(140 mg/dl)**
**Differences in diagnostic criteria of glucose intolerance**

<table>
<thead>
<tr>
<th>American Diabetes Association 1997</th>
<th>World Health Organization 1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only fasting glucose</td>
<td>Retains OGTT</td>
</tr>
<tr>
<td>IFG replaces IGT</td>
<td>IFG &amp; IGT are two distinct categories</td>
</tr>
<tr>
<td>Plasma glucose</td>
<td>Whole blood and plasma glucose</td>
</tr>
</tbody>
</table>
HOW MANY PERSONS WITH DIABETES ARE THERE?
• Number of people with diabetes in 2000:

\[ \approx 171 \text{ million} \]

• Two thirds of all persons with diabetes live in the developing world

• In these countries, most of those who have diabetes are in economically active age groups.

Source: Wild et al, 2004
Global diabetes prevalence by age and sex

- **Prevalence of diabetes (%)**
  - Males
  - Females

Age categories:
- 0-19
- 20-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-70
- 70-74
- 75-79
- 80+
Prevalence of diabetes in adults 20+ (%)
Number of persons with diabetes (millions)
Number of persons with diabetes by age group, year and region

Developed countries

Developing countries
Increase in the number of persons with diabetes in the world, 1995-2030

- 1995: 135 million
- 2000: 171 million
- 2030: 366 million
## Highest numbers of estimated cases of diabetes for 2000 and 2030

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Country</th>
<th>People with diabetes (millions)</th>
<th>Country</th>
<th>People with diabetes (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>India</td>
<td>31.7</td>
<td>India</td>
<td>79.4</td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>20.8</td>
<td>China</td>
<td>42.3</td>
</tr>
<tr>
<td>3</td>
<td>United States of America</td>
<td>17.7</td>
<td>United States of America</td>
<td>30.3</td>
</tr>
<tr>
<td>4</td>
<td>Indonesia</td>
<td>8.4</td>
<td>Indonesia</td>
<td>21.3</td>
</tr>
<tr>
<td>5</td>
<td>Japan</td>
<td>6.8</td>
<td>Pakistan</td>
<td>13.9</td>
</tr>
<tr>
<td>6</td>
<td>Pakistan</td>
<td>5.2</td>
<td>Brazil</td>
<td>11.3</td>
</tr>
<tr>
<td>7</td>
<td>Russian Federation</td>
<td>4.6</td>
<td>Bangladesh</td>
<td>11.1</td>
</tr>
<tr>
<td>8</td>
<td>Brazil</td>
<td>4.6</td>
<td>Japan</td>
<td>8.9</td>
</tr>
<tr>
<td>9</td>
<td>Italy</td>
<td>4.3</td>
<td>Philippines</td>
<td>7.8</td>
</tr>
<tr>
<td>10</td>
<td>Bangladesh</td>
<td>3.2</td>
<td>Egypt</td>
<td>6.7</td>
</tr>
<tr>
<td>Country</td>
<td>Proxy</td>
<td>2000</td>
<td>2030</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>Brazil</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>own data</td>
<td>20.1</td>
<td>42.3</td>
<td></td>
</tr>
<tr>
<td>Cuba</td>
<td>Brazil</td>
<td>0.2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>Jordan</td>
<td>2.6</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Sudan</td>
<td>0.8</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>own data</td>
<td>31.7</td>
<td>79.4</td>
<td></td>
</tr>
<tr>
<td>Indonesia</td>
<td>Singapore</td>
<td>8.4</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
<td>Singapore</td>
<td>0.9</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>own data</td>
<td>0.2</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>own data</td>
<td>2.9</td>
<td>6.4</td>
<td></td>
</tr>
</tbody>
</table>
WHY THE INCREASE IN DIABETES PREVALENCE?
IMPROVED SURVIVAL OF PERSONS WITH DIABETES?

Støvring et al, Lancet 2003
THE WORLD IS GETTING OLD
The world population is ageing

Population Pyramid in
1995 and 2025

UN Population Division, 1998 Revision
Life expectancy at birth is increasing in all regions.

Source: UN Population Division, 1998 Revision
The population in developing countries is fast increasing - particularly the aged

<table>
<thead>
<tr>
<th>Population (in billion)</th>
<th>2000</th>
<th>2025</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>6.0</td>
<td>7.8</td>
<td>8.9</td>
</tr>
<tr>
<td>More developed countries</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Less developed countries</td>
<td>4.7</td>
<td>6.6</td>
<td>7.8</td>
</tr>
<tr>
<td>65+</td>
<td>0.4</td>
<td>0.8</td>
<td>1.5</td>
</tr>
<tr>
<td>More developed countries</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Less developed countries</td>
<td>0.2</td>
<td>0.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>
THE WORLD IS GETTING FAT
Per capita food consumption (kcal per capita per day)

Adapted from “Diet, Nutrition and the prevention of Chronic Diseases”, WHO TRS 916, Geneva 2003
Trends in Obesity (BMI > 30) Brazil 1974 -1996

Source: WHO Global NCD Infobase
Prevalence of overweight and obesity in 10-year old girls and boys in selected countries.
Africa & Middle East: 4 year olds

- Morocco
- Senegal
- Burkina Faso
- Nigeria
- Niger
- Egypt
- Cameroon
- Uganda
- Rwanda
- Tanzania
- Zambia
- Namibia
- Madagascar
- Zimbabwe
- Yemen

Color Legend:
- <5%
- 5-9.9%
- 10-14.9%
- 15-19.9%
- >25%

IOTF unpublished data
Odds ratios for diabetes with increasing weight (Must et al, 1999)

- NHANES III, USA men

Body mass index

- <55 years
- >=55 years
Duration of obesity and risk of Type 2 diabetes (Everhart et al, 1992)

![Graph showing the annual incidence of diabetes based on duration of BMI ≥30.0. The x-axis represents the duration of obesity (<5 years, 5-10 years, >10 years) and the y-axis represents the annual incidence of diabetes. The graph illustrates a trend where the annual incidence of diabetes increases with longer durations of obesity.](image-url)
THE EARTH DOES NOT MOVE!
Physical inactivity in selected countries

Source: WHO Global NCD Infobase
Relative risk of Type 2 diabetes by different levels of occupational physical activity (from Hu et al, Diabetologia 2003)

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>Relative risk (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIGHT</td>
<td>1.00 (reference category)</td>
</tr>
<tr>
<td>MODERATE</td>
<td>0.70 (0.52-0.96)</td>
</tr>
<tr>
<td>ACTIVE</td>
<td>0.74 (0.57-0.95)</td>
</tr>
<tr>
<td>P- value for trend</td>
<td>0.02</td>
</tr>
</tbody>
</table>

* adjusted for age, sex, BMI, systolic BP, smoking, education, other physical activity (n= 6898 Men+7392 women, 35-64 years old)
In the year 2000 there were 3.2 million deaths attributable to diabetes