DIABETES IN SUB-SAHARAN AFRICA

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SCHEDULE

Introduction

I- EPIDEMIOLOGICAL ASPECTS
II- ATYPICAL AND CLINICAL ASPECTS
III- COMPLICATIONS
IV- MANAGEMENT

Conclusion
INTRODUCTION
AFRICAN COUNTRIES FACE THE DOUBLE BURDEN

- **Endemic** CD (AIDS, malaria, tuberculosis)

- **Epidemic** NCD (T2DM, Hypertension, coronary diseases)
- **POVERTY**: Management cost (insulin, …)

- **DISABLED**: diabetic foot (amputation), CVA (hemiplegia), blindness, CRF (young and active people),

- **MORTALITY**: acute and chronic complications (infection and coma)

  - **DIABETES** = a problem of development
I- EPIDEMIOLOGICAL ASPECTS
WORLD BURDEN OF T2DM (IDF),

- Number of diabetic adults is increasing of 54% in the world (284.5 millions in 2010 to 500 millions in 2030).
- sub-saharan Africa reach 98% (DT2+++++)
T2DM IN SUB-SAHARAN AFRICA

• 3 progressing periods

• 1959 et 1985 :
  – 0 - 1,4% in black African countries
  – 0.6 - 3,6% in South-Africa Republic.
  – Côte d’Ivoire: 5,7% (1979).

1986 - 1997 : rural-urban
  0-2% - 1-6%
Table I

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Urbain</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMEROON</td>
<td>2004</td>
<td>6</td>
</tr>
<tr>
<td>GHANA</td>
<td>2002</td>
<td>6.4</td>
</tr>
<tr>
<td>TANZANIA</td>
<td>2000</td>
<td>5.8</td>
</tr>
<tr>
<td>S AFRICA</td>
<td>2005</td>
<td>8.8</td>
</tr>
<tr>
<td>BENIN</td>
<td>2005</td>
<td>3</td>
</tr>
<tr>
<td>RDC</td>
<td>2005</td>
<td>14.5</td>
</tr>
</tbody>
</table>

1997–2010 (STEP- WISE OMS)
T1 DM

- 1.5/100,000 in Tanzania to 10.1/100,000 in Soudan.

- Mortality ++++. 

- Lack of diagnosis (lack of pediatrics diabetology training).
II- ATYPICAL AND CLINICAL ASPECTS
DIABETES CLASSIFICATION (ADA, 1997)

- **TYPE 1**: lack of insulin /destruction $\beta$ cell
  - **TYPE 1 A**: auto-immun
  - **TYPE 1 B**: idiopathic

- **TYPE 2**
  - Low insulin-secretion to insulinoresistance

- **GESTATIONNAL DIABETES**

- **SPECIFIC TYPES**
  - Genetic abnormalities in beta cell function
CLINICAL ASPECTS

CHILDHOOD DIABETES
- Difficulties in diagnosis
- Management

• DIABETES IN ELDERLY
  – frequent (20%)
  – Problem of management (poly pathology)

• GESTATIONNAL DIABETES
ATYPICAL FORMS

TROPICAL DIABETES (1%)
KETOSIS PRONE ATYPICAL DIABETES

- POPULATIONS: African-american, Asian, Sub-saharan African
Table II: CARACTERISTIC IN POPULATION WITH DSATC: America, Europe, Africa

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>UMPIERREZ, USA, 1995 (10 ys), N : 77</th>
<th>GAUTHIER, France, 2005 (15 ys), N : 111</th>
<th>ABODO, Côte d’Ivoire, 2012 (10 ys), N : 178</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>40</td>
<td>39</td>
<td>47 ys (16-72)</td>
</tr>
<tr>
<td>Family history of diabetes</td>
<td>82</td>
<td>67,6</td>
<td>44%</td>
</tr>
<tr>
<td>BMI</td>
<td>55</td>
<td>49,5</td>
<td>48%</td>
</tr>
<tr>
<td>Cpeptidemia (nle)</td>
<td>+ -</td>
<td>+ -</td>
<td>80%</td>
</tr>
<tr>
<td>Antibodies(-)</td>
<td>+ -</td>
<td>+ -</td>
<td>+ -</td>
</tr>
<tr>
<td>remission</td>
<td>76</td>
<td>85,5%</td>
<td></td>
</tr>
</tbody>
</table>

remelaps.
ETIOPATHOGENY

GENETIC

- Mutation of genes involve in insulin secretion:
  - Transcription factor $HNF-1\alpha$
  - Other genes: NGN3, Nkx2.2, PAX4 4% (Houston, USA)

Mauvais-Jarvis et al. 2003. Diabetologia, in press
Other factors

Lack in G6PD:
- KPDM: 42.3%
- T2 DM: 16.9%
- T1DM: 16%

Herpes Virus:
- KPDM: 87.7%
- T2DM: 39.9%
- T1DM: 40%
Table III: prevalence and characteristic of diabetes in Sub-saharan Africa.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Ketosis prone atypical diabetes</th>
<th>Childhood Diabetes(%)</th>
<th>Diabetes in elderly n(%)</th>
<th>Pancreatitis chronic (%)</th>
<th>Metabolic Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal (10,27)</td>
<td>-</td>
<td>-</td>
<td>7-9</td>
<td>-</td>
<td>22,5 - NCEP</td>
</tr>
<tr>
<td>Congo Brazzaville (13,17,26)</td>
<td>58 (8)</td>
<td>206 (2,8)</td>
<td>-</td>
<td>-</td>
<td>37,7 male 28,8 female NCEP</td>
</tr>
<tr>
<td>Gabon (9)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12 (22,7)</td>
<td>-</td>
</tr>
<tr>
<td>Cameroon (8)</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benin (18)</td>
<td>19 (5,4)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Côte d’Ivoire (7,11,14,16,25)</td>
<td>178 (15,7)</td>
<td>1,5-2</td>
<td>96 (20,3)</td>
<td>1 (0,8)</td>
<td>21,7 - IDF</td>
</tr>
</tbody>
</table>
III- COMPLICATIONS
Acute metabolic complications

• Keto-acidosis coma
  – Mortality 25% in Tanzania, 33% in Kenya.

Hypoglycemic coma

• Hyperosmolar hyperglycemic Coma
  – High mortality rate reach 50%.
  – Early diagnosis (Côte d’Ivoire),
    • No mortality.
DIABETIC COMAS

INSULINOTHERAPY WITH ELECTRIC SERINGUE
Diabetic foot
Diabetic hand

- Infection+++++ and gangrena on neuropathy and arteriopathy

- Also high prevalence of tuberculosis because of Diabetes –VIH association.

macro-angiopathy

• Frequent association diabetes-
  – Android Obesity
  – HBP,
  – Dyslipidemia

Metabolic syndrome: constellation of cardio-
metabolic risk factors
Public health problem
Abdominal Obesity and high adipose tissue (BMI vs WC)
waist circumference, height, BP, waist
# metabolic Syndrome
International diabetes Federation (IDF)

**Table IV: Berlin conference, 2005**

<table>
<thead>
<tr>
<th>WC+ 2 other criteria</th>
<th>Criteria</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TT (europoid)</strong></td>
<td><strong>male &gt;= 94 cm</strong>&lt;br&gt;<strong>female &gt;= 80 cm</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Tg</strong></td>
<td>≥ 1.5 g/l</td>
</tr>
<tr>
<td></td>
<td><strong>HDLc</strong></td>
<td><strong>male &lt; 0.4g/l</strong>&lt;br&gt;<strong>female &lt; 0.5 g/l</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or dyslipidemia treated</td>
</tr>
<tr>
<td></td>
<td><strong>BP</strong></td>
<td>≥ 130/85 mm Hg ou HBP treated</td>
</tr>
<tr>
<td></td>
<td><strong>Glycemia</strong></td>
<td>≥ 1 g/l ou T2DM treated</td>
</tr>
</tbody>
</table>
PREVALENCE OF METABOLIC SYNDROME CHARACTERISTIC IN COTE D’IVOIRE ABODO et coll
HBP + DIABETES: 50-70%

Prevalence of treated hypertension in 2352 patients
The DiabCare Africa Study

CONSEQUENCE DIABETES + HBP: macro-angiopathy

CHD, coronary heart disease; CHF, congestive heart failure; LVH, left ventricular hypertrophy. JNC VI. Arch Intern Med. 1997;157:2413-2446.
micro-angiopathy

• Cause by worse metabolic control of diabetes
  – High frequency: 15-55% for retinopathy, 32-57% for proteinuria.
  – Association of these different damage lead to high in-hospital mortality rate of diabetes.
IV- MANAGEMENT
Box: Difficulties in diabetes management in sub-Saharan Africa

- Chronicity of the disease
- Delayed diagnosis (asymptomatic)
- Lack of reliable epidemiological data
- No part of operational research
- Inadequate health system
- Lack of access to care
- Expensive and unavailable medicines (insulin, ....)
- Cost of the minimum balance of impact
- Cost of self-monitoring equipment and self-control
- Lack of reliable health insurance system
- Diabetes education inadequate
- Involvement of traditional medicine
- Lack of qualified personnel
- Inobservance treatment
Frederick Grant Banting
Charles Best
John Macleod
James Collip
? Marjorie

INSULINE
Life savers of 1921
Before insulin discovery a quick and certain death awaited patients with T1 DM

15/12/1922

2 months later
PHYSIOLOGICAL SECRETION OF INSULIN
Stylos à insuline et aiguilles à stylo

Stylos réutilisables (cartouche de 3 ml = 300 unités)

- Optipen Pro  de 1 à 60 unités
- HumaPen  de 1 à 60 unités
- NovoPen 3  de 1 à 70 unités
- Innovo  de 1 à 70 unités
- AutoPen  de 2 à 42 unités

Stylos jetables  (3 ml = 300 unités)

- Optiset  de 2 à 40 unités
- Umuline Pen  de 1 à 60 unités
- Innolet  de 1 à 50 unités
- Novolet  de 2 à 78 unités
- FlexPen  de 1 à 60 unités
Economic cost

– 25 % of gross national income per capita in the 12 richest countries, and almost 125% for the 34 poorest countries in the world.

– In Côte d’Ivoire, the direct cost of care represent 70 à 96% of the family budget for the poorest patients and 25 à 55% for the middle income.
Original initiative

Well-organised system

• In Guinée, Diabetes network in province (2002-2011)
  – Number of consultation X 30
  – In-hospital mortality rate reduce by 80%.

• In Côte d’Ivoire, USR (diabetes complications)
  – Mortality rate of keto-acidosis coma and diabetic foot have been reduced to one-third.
Education: MAP conversations
Material of self monitoring
Screening of glycosuria and acetonuria

When GLYCEMIA is above 3g per liter
CONCLUSION
• National screening campain

• Prevention / campain of sensitization
  – Healthy nutrition adapted on local food
  – Physical and regular activity
• - Training programmes for health workers,
• - Early management
• Education Programm for patients and populations,
  – Educators
  – Peers – Educators (diabetics Associations ).

• Traditionnal medecine
• Decentralization of diabetes care

• Involvement of political authorities, la society civil and donnors.

• Health insurance, subvention of insuline