

# Metabolic control

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# Internal “household”

- Important in keeping tissue healthy
- Major players:
  - \* Blood glucose
  - \* Lipids
  - \* Pressure
  - \* Contributors – thyroid  
- nutrients

# Why metabolic control?

- Rule of 15 :
- 15% of diabetics –ulcer
- 15 % of ulcers – amputation
- 15% of ulcers - osteomyelitis

# But.. The story goes on

- Of the amputations :
  - \* 50% -contra lateral amputation in 3 years.
  - \* 50% will die in 5 years

## Diabetes: A Growing Worldwide Problem

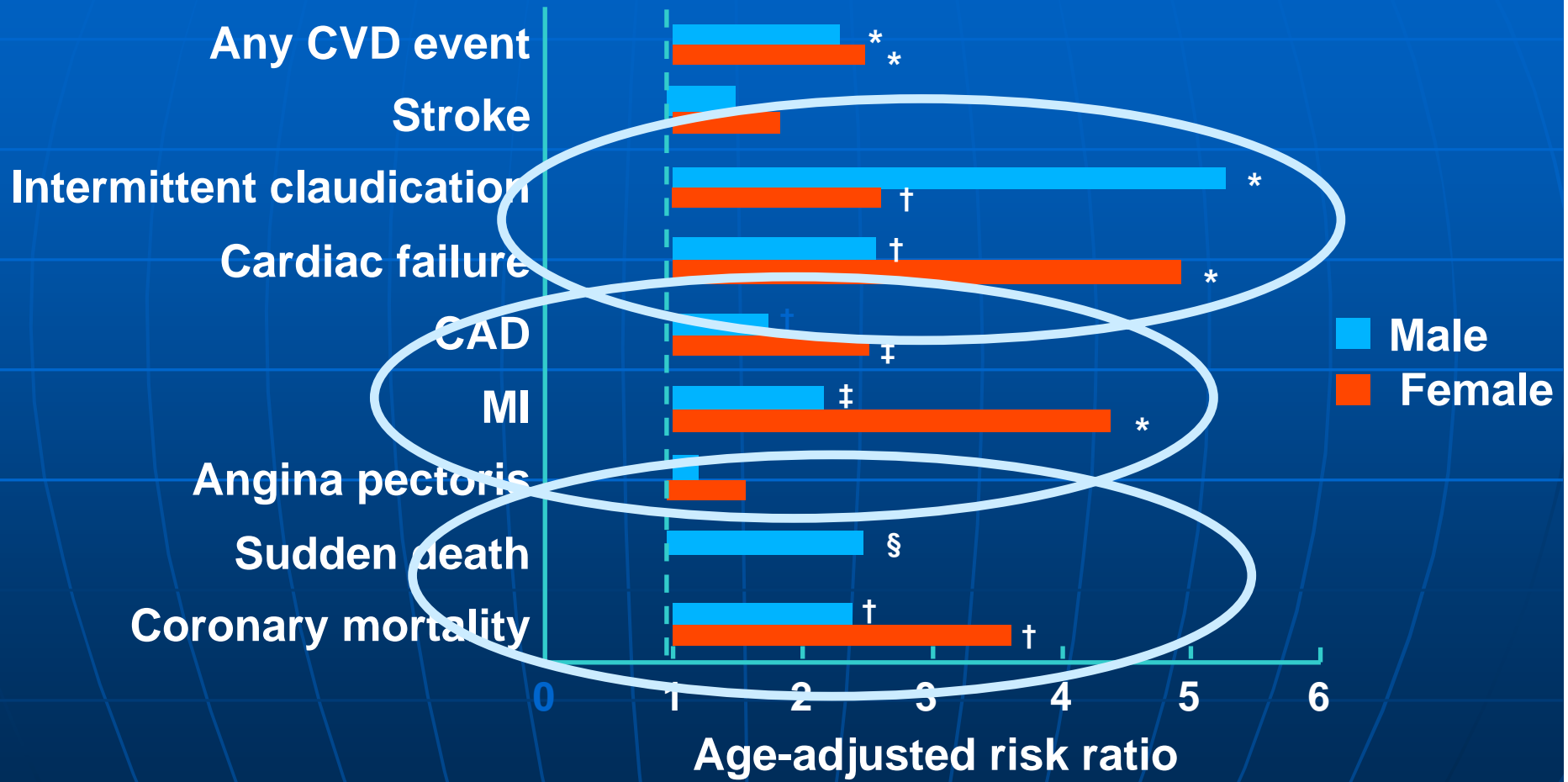
	2000 Actual No. Pts With DM*	2030 Estimated No. Pts With DM*	Increase
United States	17,702,000	30,312,000	+ 71%
Germany	2,627,000	3,771,000	+ 44%
Britain	1,765,000	2,668,000	+ 48%
India	31,705,000	79,441,000	+ 150%
China	20,757,000	42,321,000	+ 104%
Africa	7,020,553	18,244,638	+ 160%
<b>World</b>	<b>171,000,000</b>	<b>366,000,000</b>	<b>+ 110%</b>

DM=diabetes mellitus.\*Includes type 1 and type 2 diabetes.

# The end result

- QOL loss
- Economic implications - 15% rule
- 1 050 000 ulcers
- 15% amputation = 160 000
- 50% die = 80 000 !
- Important – this was 2000 data

# Relative Risk of CVD in Diabetes: Framingham Heart Study



\* $P < 0.001$ ; † $P < 0.05$ ; ‡ $P < 0.01$ ; § $P < 0.1$

Kannel WB, et al. *Am Heart J* 1990;120:672-676.

# How? Prevention

Tight glycaemic control prevent complications:

- DCCT
- Kumamoto
- UKPDS

## Good Glycaemic Control Reduces Incidence of Complications: Data From Landmark Trials

HbA <sub>1c</sub>	DCCT <sup>1</sup> 9%→7% (N=1441)	Kumamoto <sup>2</sup> 9%→7% (N=110)	UKPDS <sup>3</sup> 9%→7% (N=1797)
Retinopathy (%)	63	69	21
Nephropathy (%)	54	70	34
Neuropathy (%)	60	—	—
Macrovascular disease (%)	41	—	16

1. DCCT Research Group. *N Engl J Med.* 1993;329:977-986; 2. Ohkubo Y, et al. *Diabetes Res Clin Pract.* 1995;28:103-117; 3. UKPDS Group 33. *Lancet.* 1998;352:837-853.

# Decreased Risk per 1.0% Decrement in HbA<sub>1c</sub>

<b>Factor</b>	<b>Decrease (%)</b>
<b>Any Diabetes Related endpoint</b>	<b>21%</b>
<b>Diabetes Related Deaths</b>	<b>21%</b>
<b>All-cause Mortality</b>	<b>14%</b>
<b>Fatal and non-Fatal MI</b>	<b>14%</b>
<b>Fatal and non-fatal Stroke</b>	<b>12%</b>
<b>Cataract extraction</b>	<b>19%</b>
<b>Heart Failure</b>	<b>16%</b>
<b>Microvascular endpoints</b>	<b>37%</b>
<b>Amputation or Death due to PVD</b>	<b>43%</b>

**FACT:**

**Hyperglycaemia is a  
recognized, established  
modifiable risk factor for both  
microvascular and  
macrovascular disease**

# Targets are important

- HbA1c < 7.0 %
- LDL < 1.8
- Triglycerides < 1.0
- HDL > 1.0
- BP < 130/80 mmHg

# Cost effective ways:

- SMBG – 8 to 10 tests/day give a better idea of the problem than HbA1c - spot check days.
- HbA1c = average
- Waist circumference - Men > 102cm  
- Women > 88cm

Good predictor of pre-diabetes!

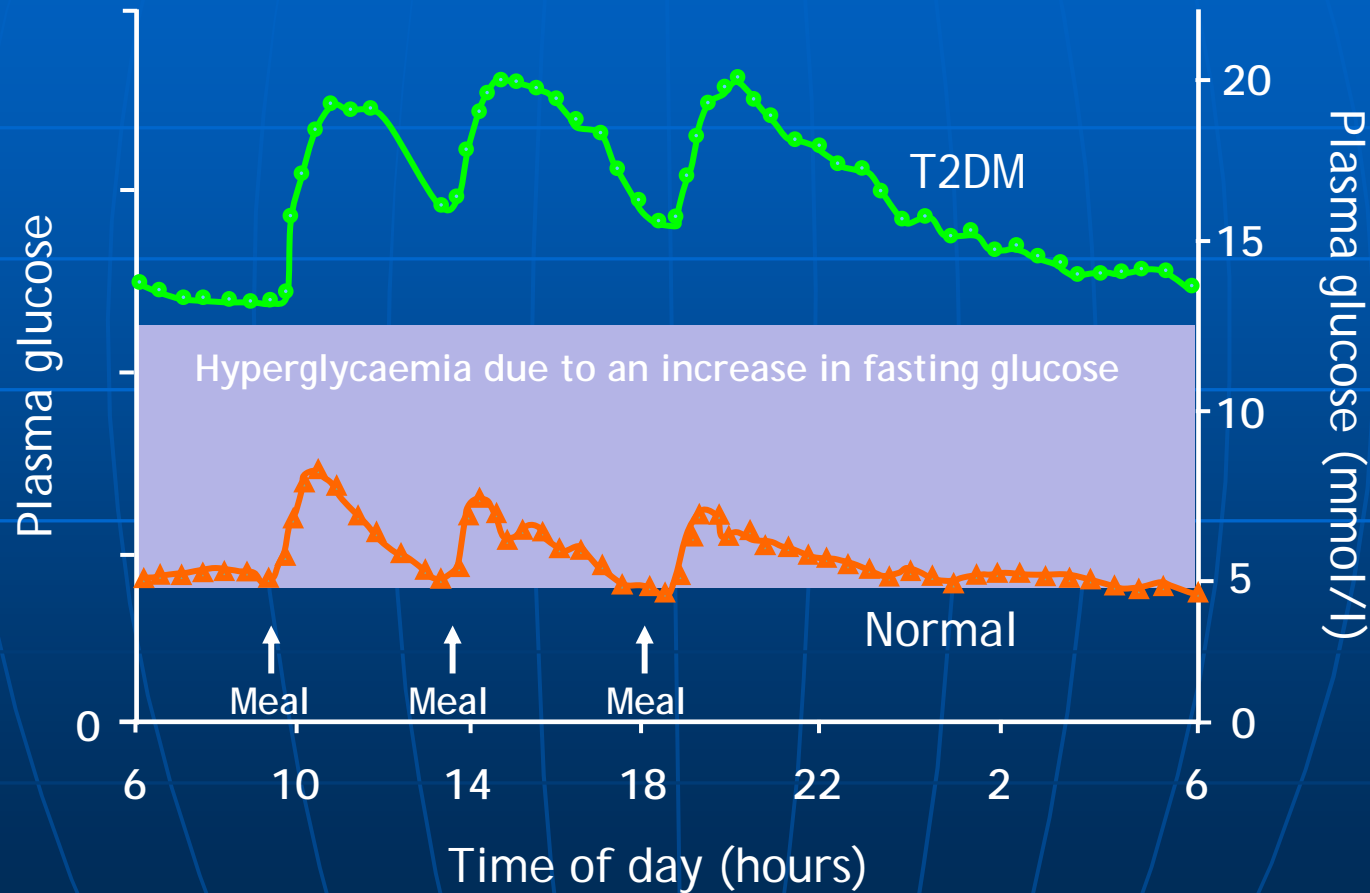
# Where to start -glucose

- HbA1c > 9% - start at fasting.
- Add 2<sup>nd</sup> tablet or insulin.
- Insulin earlier than later in type 2.
- Increase to MDI or pump therapy in type 1.
- Goals: Fasting < 5.5 mmol  
2h PPG < 7.8 mmol.

# Remember F- rule

- Fix Fasting First

# Treating fasting hyperglycaemia lowers the entire 24-hour plasma glucose profile



Comparison of 24-hour glucose levels in control subjects vs patients with diabetes ( $p < 0.001$ ).  
Adapted from Polonsky K, et al. N Engl J Med 1988;318:1231-9.

# More prevention

- Blood pressure < 130/80 mmHg.
- Use of ACEI important – ADVANCE study clearly showed risk reduction of 18% in CVD (perindopril, indapamide)
- NNT – 1 in 80 Pt to prevent macrovascular complications
- 22% reduction in microalbuminuria

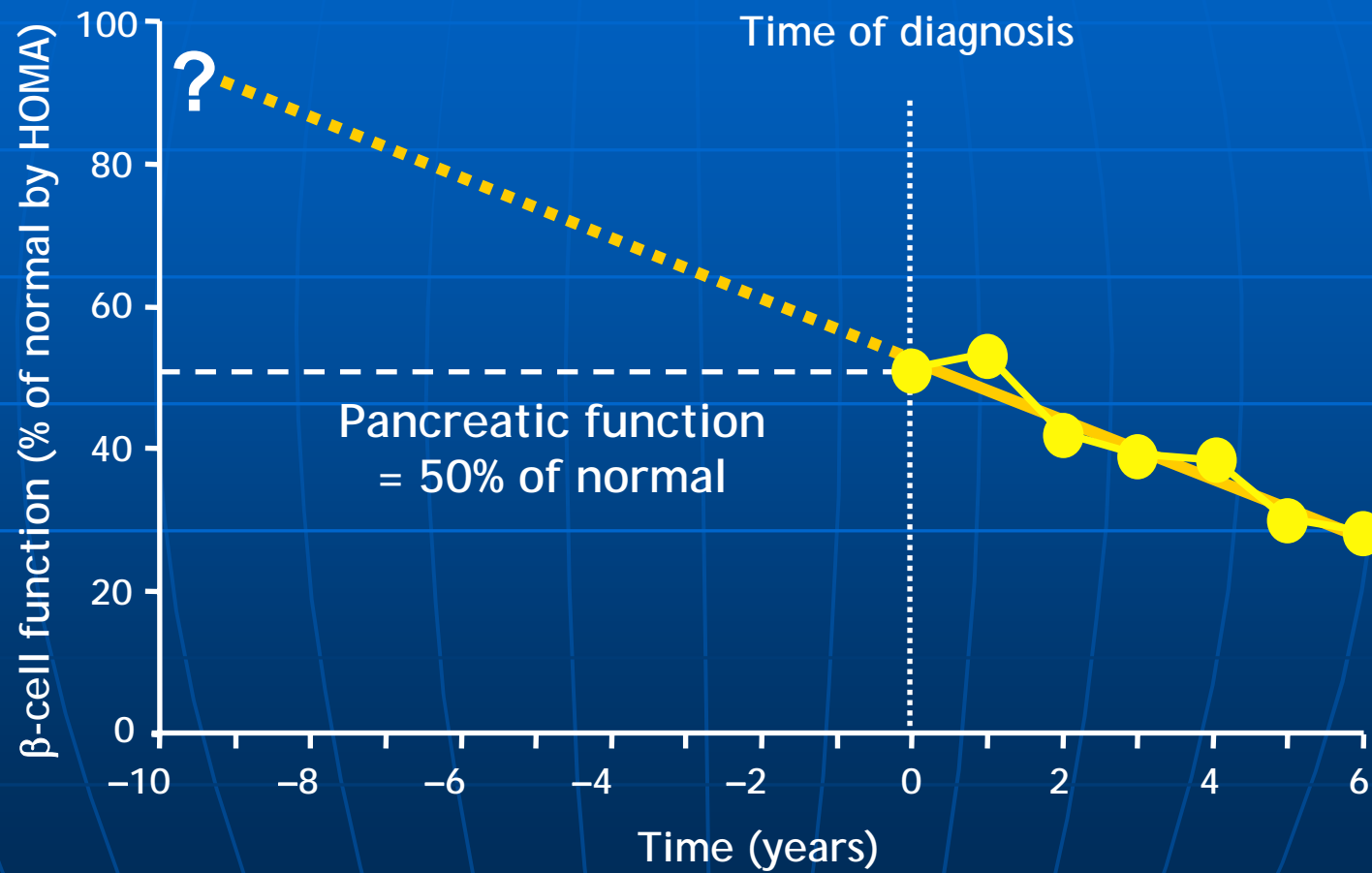
# Microalbuminuria

- Cost effective and easy way to predict micro and macro vascular complications in Diabetes
- If positive start use of ACEI or ARB as add on to other medication already in use

# Medication

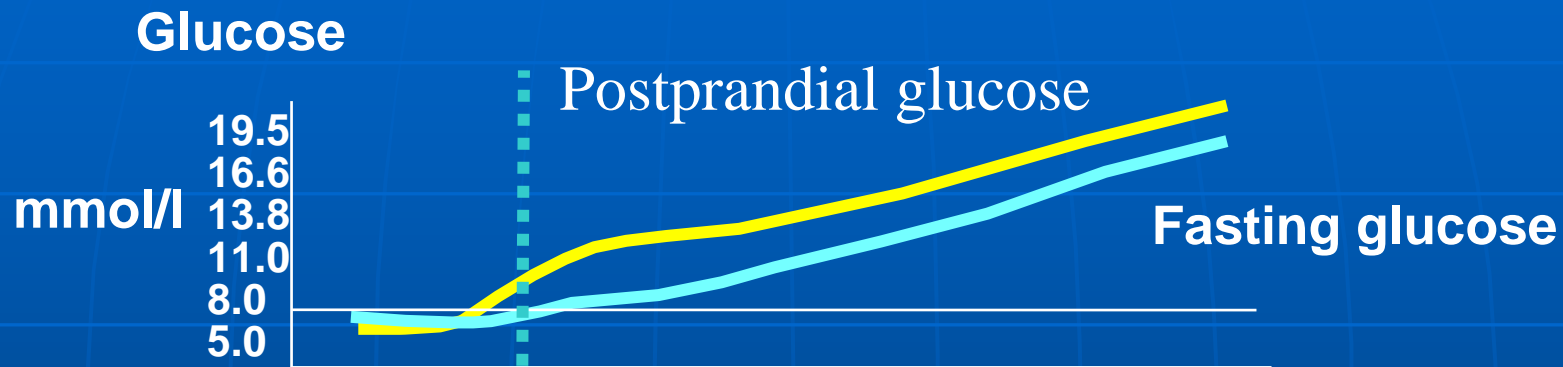
- All DMt2 should be on statin (CARDS study)
- Early use of insulin to preserve Beta cells in DMt2
- Use of Incretins (GLP1) to preserve beta cells and improve weight loss
- TZD : Increased incidence of limb fractures. Fractures lead to foot abnormalities (ADOPT -50% increase)

# Progressive nature of type 2 diabetes



HOMA=homeostasis model assessment.  
Adapted from Holman RR. Diabetes Res Clin Pract 1998;40(suppl 1):S21-5.

# Natural History of Type 2 Diabetes



At risk for diabetes

Beta-cell dysfunction



# Insulin

- Early start - supplementation
- Late start – full replacement

Can you guess the magic number?



# Remember the magic number

- Start at 10
- 2 units every third day until at target fasting blood glucose of 6.0mmol
- Treat to Target program
- Individualised
- If HBA1c > 7% check 2 hours post prandial.
- If PPG >8.0mmol add bolus

# Metabolic control

- Prevention is important (5yr)
- Continuous care is more important (gas)

Thank you

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