

Prevention of Diabetes:

A myth?

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# Definition

- Primary
  - Prevention of overt diabetes
- Secondary
  - Prompt identification and halting of progression
- Tertiary
  - Prevention of complications

Why prevent diabetes?

# Why prevent diabetes?

- 10-15% of total Health Costs
  - Numerous complications linked to T2DM
- Prevention works!
  - Ethnic experimentation (observation)
    - Australian Aboriginals
      - Reversibility of hyperglycemia after return to a hunter-gatherer life

# Major prevention studies based on Lifestyle

# Major Lifestyle Prevention Studies

## Da-Qing study

- 577 participants with IGT
- Diet-alone, Exercise-alone, Diet-Exercise combined
- Cumulative 6-year incidence difference of 24% between interventional vs non-interventional group (44% vs 68%)
- 20-year post intervention period showed persistence of protective effect

# Major Lifestyle Prevention Studies

## Finnish Diabetes Prevention Study

- 522 participants with IGT, BMI > 25 kg/m<sup>2</sup>
- Nutritional follow-up and endurance exercise
- Difference of 12% in terms of progression to T2DM between intervention and control group (24% vs 12%)



# Major Lifestyle Prevention Studies

## Diabetes prevention program (US)

- Intense activity: >150 min activity/week
- Mean weight loss of 10kg
- For every kg lost, risk of T2DM was reduced by 16%
- 44% lower incidence of T2DM in interventional vs control group

# Major Lifestyle Prevention Studies

## Indian Diabetes Prevention Program

- 531 subjects
- Lifestyle, metformin and combination of both
- 27% difference between control and intervention group after 30 months (55% vs 28%)
- No added benefit of metformin

# Major Lifestyle Prevention Studies

- Other studies
  - Chinese prevention study: No superiority of dieting over exercise
  - PREDIMED-Reus study: T2DM risk reduction achieved with Mediterranean diet

What factors do we need target?

# Factors identified

- Obesity
- Sedentary lifestyle
- Westernized diet:
  - Low fiber
  - High saturated fat
  - Sweetened beverages
- Voluntary sleep deprivation
- Obstructive sleep apnea syndrome

Who do we need to target?



# Target populations

1. White >40 yrs and black, Asian > 25 yrs with one or more of the following risk factors:
  - First-degree family history of diabetes and/or
  - BMI >25kg/m<sup>2</sup>
  - Waist Circumference >94 for white and black men, >90cm Asian men; >80 cm for white, black and Asian women
  - BP >140 for systolic and >90 for diastolic (or treated hypertension)
  - HDL <35 mg/dL or Triglycerides >200mg/dL (or treated dyslipidemia)



# Target populations

2. History of gestational diabetes
3. History of ischemic heart disease, cerebrovascular disease and peripheral vascular disease
4. Women with polycystic ovarian disease and BMI > 30 kg/m<sup>2</sup>
5. People with severe mental health problems and/or receiving long-term antipsychotic drugs
6. History of Impaired glucose Tolerance / Impaired Fasting Glucose

# Target populations

- Patients with Impaired Glucose Tolerance (IGT)
  - Blood Glucose between 7.8 and 11.1 mmol/L at 2nd hour of OGTT test
  - 50% will develop T2DM in a 10-year follow-up
    - Rate even faster in Asian populations

# Gestational diabetes

- Diagnosed between the 24<sup>th</sup> and 28<sup>th</sup> week of pregnancy on one of the following criteria following 75 g Oral Glucose Tolerance Test (OGTT):
  - FPG  $\geq$  5.1 mmol/L (92 mg/dL)
  - 1-hour post-prandial  $\geq$  10.0 mmol/L (180mg/dL)
  - 2-hour post-prandial  $\geq$  8.5 mmol/L(153mg/dL)

# Gestational diabetes

Gestational Diabetes



# Gestational diabetes

- Complications
  - Excess growth of the baby (macrosomia)
    - increases risks during labor and delivery
  - Birth defects and an increased rate of miscarriage.
  - Neonatal hypoglycemia
  - Increased risks for T2DM for the mother after delivery
  - Macrosomic individual at increased risk of premature diabetes

# Lifetime prevention strategy



Why is there a disparity in terms of incidence/prevalence of T2DM amongst different populations?

# Prevalence Variability

- Variation in
  - Genetics
  - Physical activity
  - Phenotype (Fat distribution and percentage)
  - Food habits (Fat and fiber contents in diet)
  - Foetal factors, epigenetics



# Risk factors for T2DM in Asian and migrant south Indians

- Higher genetic predisposition
- Lower physical activity scores reported amongst South Asians as compared to white populations
  - Inactivity is an independent cardiometabolic risk factor

# Risk factors for T2DM in Asian and migrant south Indians

- Overall and abdominal obesity
  - Lower rates of overweight and obesity than Western counterparts but higher prevalence of T2DM
  - 25% of DM patients in India and Bangladesh have BMI  $<19\text{kg}/\text{m}^2$ 
    - However high incidence of abdominal obesity and low muscle mass

# Risk factors for T2DM in Asian and migrant south Indians

- Food habits:
  - Carbohydrates represent 60-70% of daily calorie intake
  - Clarified butter which contains transfatty acids (associated with weight gain, insulin resistance)
  - High glycemic index food (especially rice) associated with twofold risk of T2DM

# Prevalence Variability

- Variation in
  - Genetics
  - Physical activity
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# Theories about genetic basis for obesity and T2DM

- *Thrifty genotype (James Neel)*: Famines throughout human history have selected genes promoting the storage of fat to prolong survival.
  - Obesity and type 2 diabetes are the consequences in a Western world where famines do not occur

# Theories about genetic basis for obesity and T2DM

- *Drifty genotype (John Speakman)*: Obesity and type 2 diabetes are the consequences of the release from negative selection, i.e. less need for mobility to escape predators and thereby freedom for body weight to increase

# Thrifty phenotype

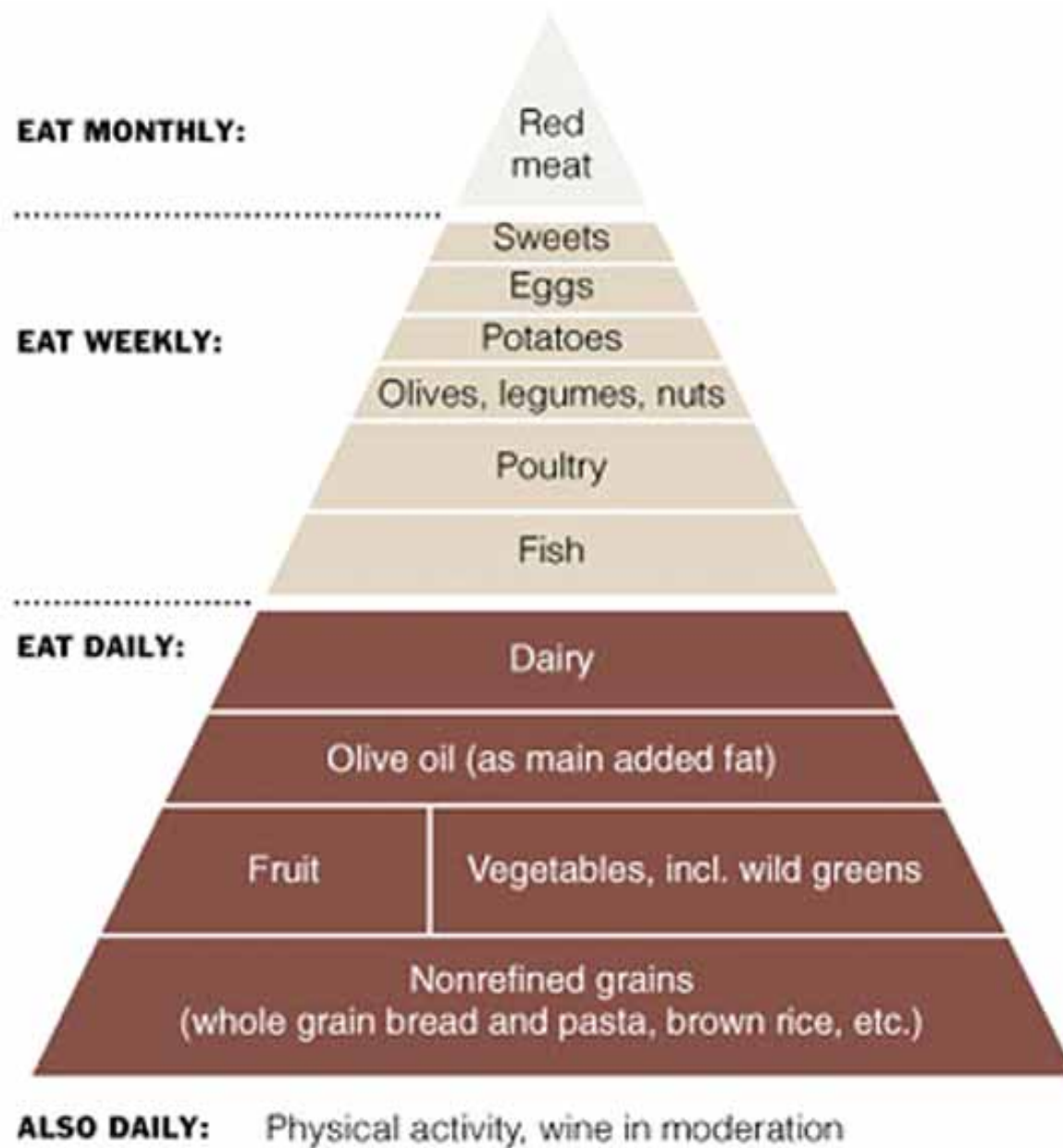
- *David Barker*: Obesity and type 2 diabetes are the consequences of a mismatch between caloric restriction during the foetal stage, with impaired organ development, and subsequent caloric abundance

How to treat?



# Recommendations

- Recommended diet (summary):
  - Aim for high intake of vegetables
  - Unrefined, wholegrain cereal products
  - Vegetable oils such as olive oil for everyday use
  - Opt for fish, dairy or vegetable sources of proteins
  - Limit intake of highly processed, energy-dense foods that are high in fat and refined sugar



Quality but most of all  
Quantity

# Recommendations

- Weight loss
  - 16% decrease of T2DM risk per kg lost
- Physical activity: 150min/week
  - Reduces T2DM risk especially amongst those not able to reach weight reduction goal
  - Regular activity reduces risk of T2DM in adults by 20-60% in a dose-response manner

# Medical management of Obesity

**FDA** **DECEMBER**  
**2014**

Liraglutide

CAS No: 204656-20-2

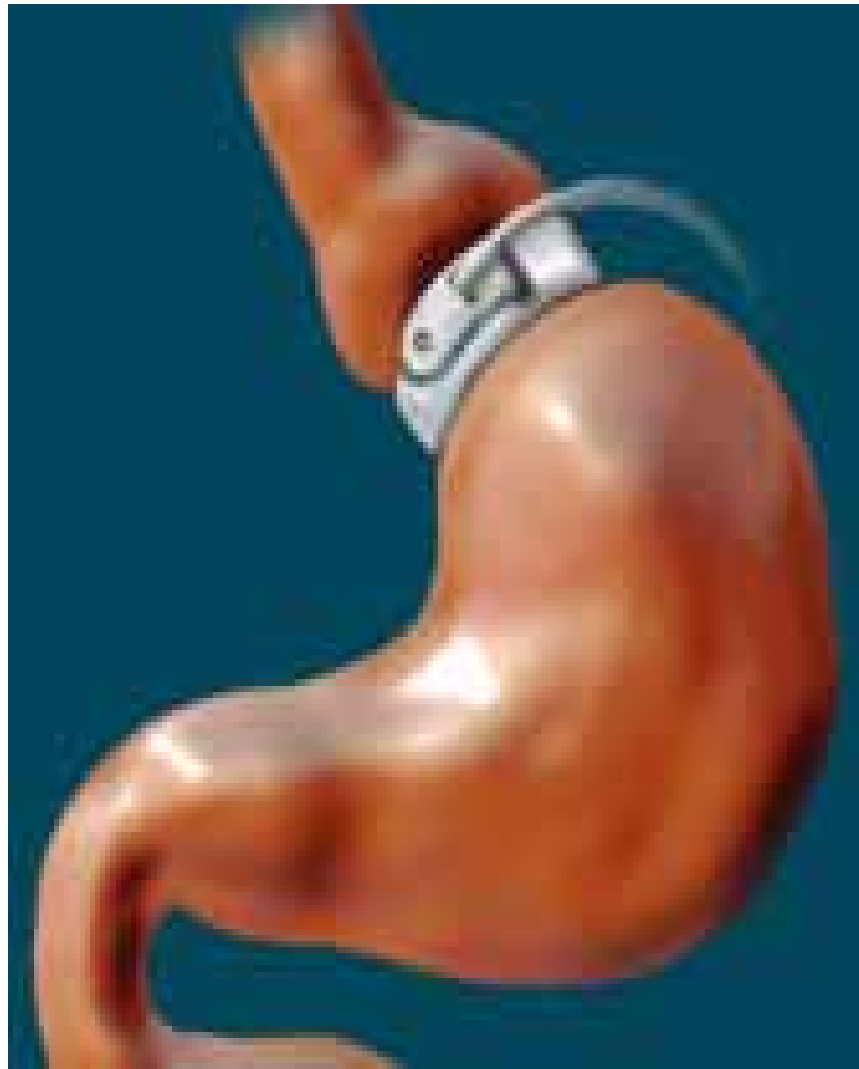
*Liraglutide FDA  
Approved As 1st Ever  
Injectable Weight  
Loss Drug*



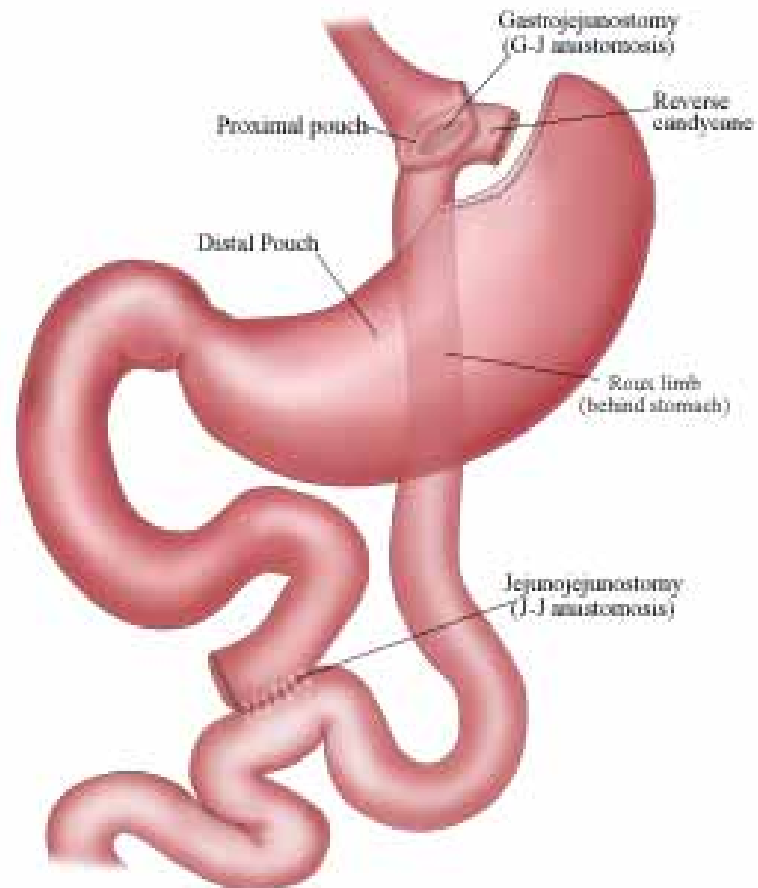
# Surgical Management of Obesity

- Gastric Banding
- Gastric bypass
- Sleeve Gastrectomy

# Gastric banding

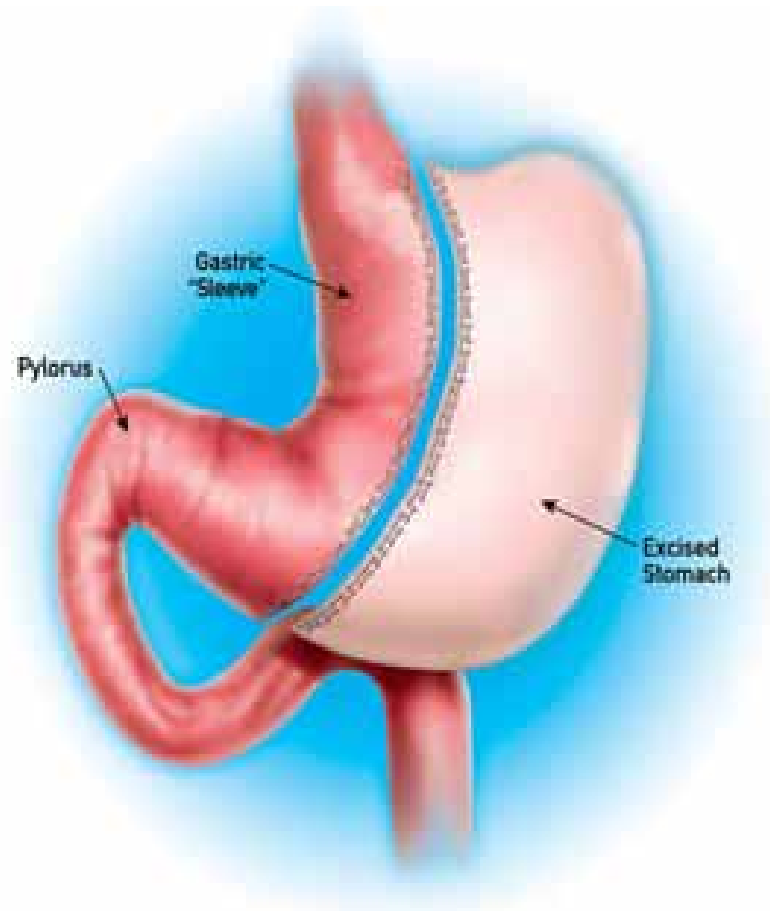


# Gastric bypass





# Sleeve gastrectomy



# Conclusions

- Primary prevention works
- Target population
- Simple advice on quality but quantity is prime
- Medication available
- Surgery can be very helpful if BMI > 35 kg/m<sup>2</sup> with or without co-morbidities

Thank you