

Impaired fetal growth

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Outline

- Terms and definitions
- Factors influencing size at birth
- Problems associated with impaired fetal growth and their significance
- Diagnosis
- Management
- Prevention

Terms and Definitions

Commonly used terms

- Prematurity
- Low birthweight (LBW)
- Small for gestational age (SGA)
- Intrauterine growth restriction (IUGR)

Prematurity

- Should refer to functional immaturity of organ systems
 - E.g. Respiratory immaturity
- When is functional maturity achieved?
- “Preterm” refers to relation to chronological age
 - Refers to gestation less than 37 weeks

Low birthweight (LBW)

- All infants weighing less than 2500 g at birth
- Does not consider gestational age
- Different problems included in the same group
 - Small and average sized preterm infants
 - Small sized term infant
- Proxy indicator for growth restriction and prematurity
- VLBW < 1500g; ELBW < 1000 g

Small for gestational age (SGA)

- Smaller than expected for given gestational age
- How much smaller?
 - Less than 10th centile
 - Less than 5th centile
 - Less than -2 SD
- Synonyms
 - Small for dates (SFD), Light for dates (LFD)

Intrauterine growth restriction

- Restriction or slowing of the rate of intrauterine fetal growth
- Not synonymous with SGA
- Demonstration of slowing of growth rate

Factors influencing size at birth

Size at birth

- Size at birth depends on
 - Gestation at birth
 - Fetal growth rate
- A baby may be small at birth because
 - It was born earlier than normal, or
 - Its rate of intrauterine growth was slower than normal, or
 - It had impaired growth and was born early

Factors influencing growth

- Fetal
- Placental
- Maternal
- Environmental

Fetal factors

- Abnormal karyotype
 - Trisomies
- Fetal sex
 - Male fetuses heavier by 100-150 g
- Genetic influences
 - Parental size
 - Ethnic group

Placental factors

- Placental infections
 - Malaria, syphilis
- Placental infarction
- Placentation
 - Later born babies are 100-150 g heavier than first born babies

Maternal factors

- Maternal size
 - limiting effects
 - adjusting birthweight centiles for maternal height
- Maternal illness
- Nutrition
 - Anaemia
 - Malnutrition

Environmental factors

- Altitude
 - Lower birthweight at higher altitudes
- Tobacco abuse
 - Active smoking
 - Passive smoking
 - Tobacco chewing

Environmental factors

- Cooking fuels
 - Coal, wood, animal dung
 - Poor ventilation
 - Carbon monoxide inhalation
- Other heavy manual work
 - Agriculture
 - Carrying water

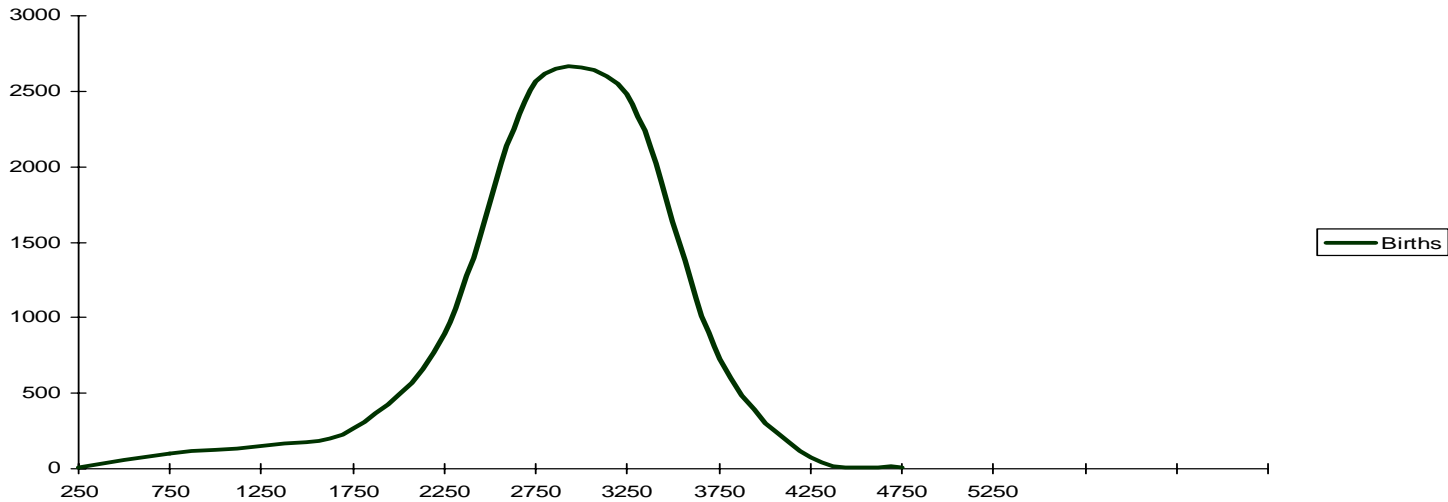
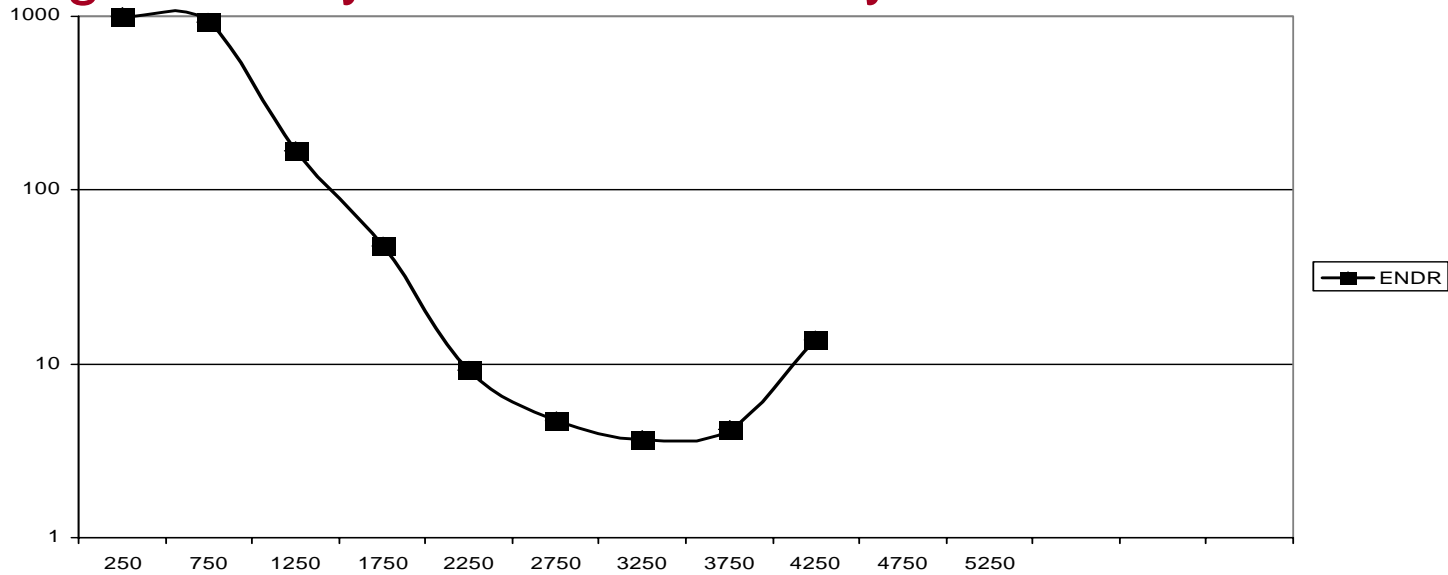
Problems associated with impaired fetal growth

- Low birthweight babies are approximately 20 times more likely to die than heavier babies
- Goal of reducing low birthweight incidence by at least one-third between 2000 and 2010 is a major goal in “A World Fit for Children” (UN 2002)

Morbidity

- Immediate
 - Increased risk of suspected fetal distress
 - Increased risk of interventions
 - Increased risk of problems after birth
 - Hypoglycemia, hypothermia, poor feeding
- Medium to long term
 - Learning disabilities
 - Increased risk of hypertension, heart disease, diabetes

Birthweight & early neonatal mortality – Vellore 2001



Birthweight and perinatal mortality

- Birthweight < 5th centile OR 5.6
- Birthweight 5th - 10th centile OR 2.8
- Birthweight 10th – 15th centile OR 1.9

- Growth rate in third trimester is a better predictor of intrapartum problems and immediate perinatal outcomes than estimates of fetal size

Diagnosis

Clinical methods

- Identification of risk factors
- Maternal weight gain
- Abdominal palpation
- Tape measurements

Laboratory methods

- Biochemical methods
- Ultrasound
 - Routine vs selective use
 - Fetal biometry
 - Biophysical score
 - Cardiotocography
 - Doppler

Birthweight standards

- Cross sectional data on birthweight and gestation
- Graph of birthweight against gestation
- Cut off levels for classification
 - 10th and 90th centile
 - Small, appropriate and large for gestation

Population based standards

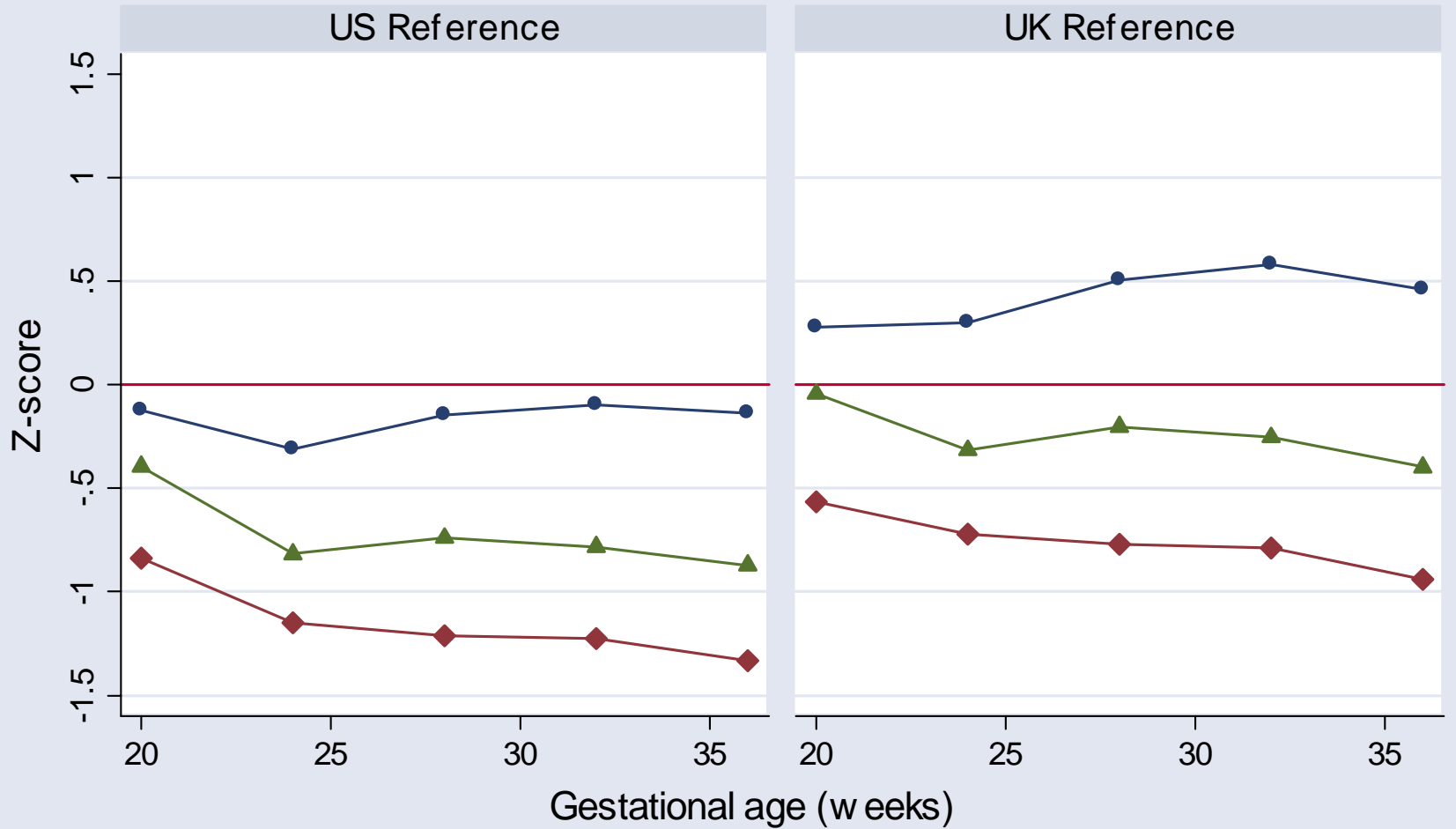
- Hospital births
- Physiological and pathological factors influencing size at birth
 - Misclassification if appropriate adjustments are not made
- Ethnic composition
- Accuracy of gestation
- Growth and preterm births

Antenatal clinical estimation

- Possible everywhere but requires training and experience
- Abdominal palpation
- Tape measurements of fundal height
 - Widely used for assessing fetal growth and size
 - Insufficient evidence from only randomized trial

Ultrasound based standards

- Hospital based
- Mostly cross-sectional studies
- Measurements include
 - Head size (BPD, HC)
 - Abdominal circumference
 - Femur length
- Weight estimation
- Interval growth measurements



Graphs by Reference

Ultrasound based standards

- Equations for estimation of fetal weight
 - Hadlock equations commonly used
- Rossavik model
 - Early estimate of fetal growth rate
 - Project fetal weight at birth based on growth rate

Population based or individualised standards for fetal growth?

- Physiological factors
 - Size of the mother
 - Birth order
 - Sex
 - Ethnicity
- Adjustments made while interpreting size at birth

Individualise

- For physiological factors
- Computer generated graph (Gardosi et al)
- Higher antenatal detection of small for dates (48% vs 24%; OR 2.2, 95% CI 1.3-1.5)
- OR for stillbirth in small for dates by
 - Individualised graph 6.1 (95% CI 5.0-7.5)
 - Standard graph 1.2 (95% 0.8-1.9)

Management

Management options

NO EVIDENCE OF BENEFIT

- Bed rest in hospital
- Hormone therapy
- Betamimetic therapy
- Antihypertensive therapy
- Nutrient supplementation
- Maternal oxygen administration
- Plasma volume expansion
- Routine ultrasound
- Cardiotocography
- Biophysical scoring

Possible benefit

- Delivery at the appropriate time
 - Will the baby survive better in the uterus or outside it ?
 - Nursery facilities
 - Costs of treatment
- Reducing birth asphyxia
 - Mode of delivery?

Beneficial interventions -1

- Doppler ultrasound for deciding on the time of delivery
 - Fewer inductions OR 0.83 (0.74-0.93)
 - Less hospital admissions OR 0.56 (0.43-0.72)
- Corticosteroids prior to preterm delivery
 - Less RDS OR 0.53 (0.44-0.63)
 - Less IVH OR 0.48 (0.48-0.75)
 - Fewer neonatal deaths OR 0.60 (0.48-0.75)

Beneficial interventions - 2

- Amnioinfusion in labour
 - Less FHR decelerations RR 0.54 (0.43-0.68)
 - Less CS for suspected fetal distress RR 0.35 (0.24-0.52)
 - Nursery stay > 3 days RR 0.40 (0.26-0.62)

Prevention

Beneficial effect

- Smoking cessation
 - LBW RR 0.81 (0.70-0.94)
 - Preterm births RR 0.84 (0.72-0.98)
 - Mean birthweight increase 33 g (11-55g)
- Balanced energy and protein supplementation
 - Less SGA RR 0.68 (0.56-0.84)
- Treatment of asymptomatic bacteriuria
 - LBW/Preterm RR 0.60 (0.45-0.80)

Summary

- Impaired fetal growth is associated with increased perinatal morbidity and mortality and increased risks in later life
- Diagnosis is made by demonstrating slowing of growth over a period of time using appropriate standards for fetal size
- There are few beneficial interventions that improve fetal growth
- Delivery at the appropriate time with skilled newborn care is the key to improved newborn survival