Intrauterine growth restriction

Synonym: fetal growth restriction

What is intrauterine growth restriction?

Intrauterine growth restriction (IUGR) is a condition where a fetus' growth slows or ceases when it is in the uterus.

It is part of a wider group: small for gestational age (SGA) fetuses - which includes fetuses that have failed to achieve their growth potential and fetuses that are constitutionally small.

The terms IUGR and SGA are often used synonymously. However, there is a difference in meaning: [1]

- The SGA definition is based on the cross-sectional evaluation (either prenatal or postnatal) and this term has been used for those neonates whose birth weight is less than the 10th percentile for that particular gestational age or two standard deviations below the population norms on the growth charts. The definition considers only the birth weight without any consideration of the in-utero growth and physical characteristics at birth.
- IUGR is a clinical definition and applies to neonates born with clinical features of malnutrition and in-utero growth restriction, irrespective of their birth weight percentile.

A baby may not be SGA but may still be considered to have IUGR if they have features of in-utero growth restriction and malnutrition at the time of birth. Therefore, neonates with a birth weight less than the 10th percentile will be SGA but not considered to be IUGR if there are no features of malnutrition. A neonate with a birth weight greater than the 10th percentile will be considered to be IUGR in spite of not being SGA, if the infants have features of malnutrition at birth.

Approximately 50-70% of fetuses with a birth weight below the tenth centile for gestational age are constitutionally small. The lower the centile for defining SGA, the greater the likelihood of IUGR.[2]

Aetiology of intrauterine growth restriction[1]

IUGR is the common result of maternal, placental, fetal or genetic factors. Various maternal factors such as age of the mother, inter-pregnancy interval (less than 6 months or 120 months or more), maternal health, behavioural habits and maternal infection affect the growth of the fetus and are responsible for causing IUGR.

Any mismatch between the supply of nutrients by the placenta and the demands of the fetus may also lead to IUGR. Fetal malformations, inborn errors of metabolism and chromosomal abnormalities are responsible for IUGR in a few cases.

The incidence of IUGR is six times higher in underdeveloped or developing countries when compared to that in developed countries.

- Maternal factors:
    - Maternal age (less than 16 years or more than 35 years).
    - Low socio-economic status.
    - Parity (none or more than five births).
    - Inter-pregnancy interval (less than 6 months or 120 months or more).
    - Previous delivery of a baby with SGA.
    - Maternal substance abuse (smoking, alcohol, illicit drugs such as marijuana or cocaine).
    - Maternal medication (eg, warfarin, steroids, anticonvulsants, antineoplastic, antimetabolite, and folic acid antagonists).
    - Maternal pre-pregnancy BMI less than 20, weight less than 45 kg or more than 75 kg.
    - Assisted reproductive technologies.
    - Pregnancy: moderate to heavy physical work, severe maternal starvation, poor weight gain, high-altitude and maternal hypoxia, poor medical care.
    - Maternal medical disorders - eg, asthma, cyanotic congenital heart disease, hypertensive disorders, pre-eclampsia, diabetes associated with vasculopathy, chronic kidney disease, systemic lupus erythematosus, antiphospholipid syndrome, sickle cell disease; acquired thrombophilia - eg, anti-cardiolipin antibodies and lupus anticoagulant.
    - Maternal infection and parasite infestations: TORCH syndrome (= toxoplasmosis, other, rubella, cytomegalovirus, herpes simplex), malaria, tuberculosis, urinary tract infections and bacterial vaginosis).

- Fetal factors:
    - Chromosomal abnormalities - eg, trisomies 13, 18, or 21, autosomal deletions, triploidy, ring chromosomes and uniparental disomy.
    - Genetic syndromes - eg, Russell-Silver syndrome, Rubinstein-Taybi syndrome, Dubowitz's syndrome, Seckel's syndrome, Fanconi's syndrome.
    - Major congenital anomalies - eg, tracheo-oesophageal fistula, congenital heart disease, congenital diaphragmatic hernia, abdominal wall defects (omphalocele or gastroschisis), neural tube defect (eg, anencephaly), anorectal malformation.
    - Multiple pregnancy.
    - Congenital infections (TORCH syndrome, malaria, congenital HIV infection, syphilis).
    - Metabolic disorders - eg, congenital lipodystrophy, galactosaemia, generalised gangliosidosis type I, hypophosphatasia, fetal phenylketonuria.
- Placental factors - eg, placental dysfunction (including pre-eclampsia), placental abruption.
- Genetic factors: placental genes, maternal genes, fetal genes.

Classification[1]

There are predominately three types of IUGR: asymmetrical IUGR (malnourished babies), symmetrical IUGR (hypoplastic SGA) and mixed IUGR.

Symmetrical IUGR

- Cause of IUGR earlier in pregnancy.
- Antenatal scan: head circumference, abdominal circumference, biparietal diameter and fetal length all proportionally reduced.
- Postnatal weight, length and head circumference all reduced.

- Features of malnutrition less pronounced but prognosis relatively poor.

Asymmetrical IUGR

- Cause of IUGR later in pregnancy.
- Antenatal scan: abdominal circumference decreased; biparietal diameter, head circumference and femur length all normal.
- Postnatal: reduction in weight; length and head circumference normal (brain sparing growth).
- Features of malnutrition more pronounced but prognosis relatively good.

Mixed IUGR

- Results when early IUGR is affected further by placental causes in late pregnancy.
- Affected neonates have clinical features of both symmetrical and asymmetrical IUGR at birth.

Diagnosing a small for gestational age fetus and fetal growth restriction[2]

- Fetal abdominal circumference (AC) or estimated fetal weight (EFW) <10th centile can be used to diagnose an SGA fetus. Use of a customised fetal weight reference may improve prediction of an SGA neonate and perinatal outcome.
- When using two measurements of AC or EFW to estimate growth velocity, they should be at least three weeks apart to minimise false positive rates for diagnosing IUGR.
- Where the fetal AC or EFW is <10th centile or there is evidence of reduced growth velocity, women should be offered serial assessment of fetal size and umbilical artery Doppler scan.

Assessment[2]

In a high-risk population, the use of umbilical artery Doppler scan has been shown to reduce perinatal morbidity and mortality. See the separate Small for Gestational Age Babies article for further information about assessment, investigations and management.

Early admission is recommended in women in spontaneous labour with an SGA fetus, in order to instigate continuous fetal heart rate monitoring. [3]

Complications

Short-term

Neonates with IUGR are prone to various complications after birth - eg, perinatal asphyxia, meconium aspiration, persistent pulmonary hypertension, hypothermia, hypoglycaemia, hyperglycaemia, hypocalcaemia, polycythaemia, jaundice, feeding difficulties, feed intolerance, necrotising enterocolitis, late-onset sepsis, pulmonary haemorrhage.

Long-term

Infants with IUGR are prone to poor growth and neurodevelopmental outcome when they reach the school-going age and adulthood. Neuro-developmental problems include:

- Lower scores on cognitive testing.
- General and specific learning difficulties: difficulties in schools or requiring special education; low social competence; poor academic performance; lower levels of intelligence.
- Cerebral palsy, gross motor and minor neurological dysfunction.
- Behavioural problems: hyperactive behaviour, attention deficit hyperactivity disorder.
- Poor perceptual performance, poor visuo-motor perception.
- They are also more susceptible to develop adult-onset diseases in their infancy and adolescence - eg, diabetes, hypertension, obesity, metabolic syndrome, coronary heart disease.

See the separate Problems in Small Babies article for further information.

Prognosis[1]

Neonates with IUGR are prone to complications after birth, including perinatal asphyxia, meconium aspiration, persistent pulmonary hypertension, hypothermia, hypoglycaemia, hyperglycaemia, hypocalcaemia, polycythaemia, jaundice, feeding difficulties, feed intolerance, necrotising enterocolitis, late-onset sepsis and pulmonary haemorrhage.

There is also an increased risk of neurobehavioural abnormalities, poor growth and increased susceptibility to adult-onset diseases in infancy and adolescence, including obesity, metabolic syndrome, type 2 diabetes and cardiovascular disease.

See the separate Problems in Small Babies article for further information.

Prevention of small for gestational age fetuses/neonates[2]

- Antiplatelet agents may be effective in preventing SGA in women at high risk of pre-eclampsia, although the effect size is small.
- In women at high risk of pre-eclampsia, antiplatelet agents should be commenced at, or before, 16 weeks of pregnancy.
- There is no consistent evidence that dietary modification, progesterone or calcium prevents SGA.
- Interventions to promote smoking cessation may prevent SGA and should be offered to all pregnant women who smoke.
- Antithrombotic therapy appears to be a promising therapy for preventing SGA in high-risk women. However, there is insufficient evidence, especially concerning serious adverse effects, to recommend its use.

Further reading

- Saving Lives Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2017-19; MBRRACE-UK, Nov 2021

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