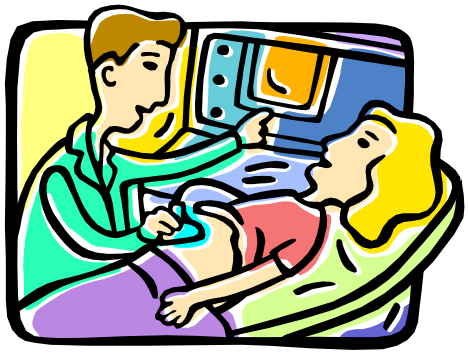
THE HIGH RISK FETUS AND PREGNANCY

FACT FILE 3B

Unit 2B covered the normal, healthy pregnancy with an overview of routine antenatal screening. We now turn to the concept of 'high-risk'. How are problems or abnormalities detected in pregnancy and what makes a pregnancy high risk?



Screening for abnormalities and risk

Summary of Antenatal Screening in pregnancy
Referring back to Unit 2B, screening is carried out to determine the level of 'risk 'of the pregnancy that could potentially affect the fetus and to lead to any further diagnostic testing. It is essential that women receive clear and accurate information in pregnancy about the tests carried out and options available to them. An overview of the routine antenatal screening offered to women in pregnancy can be seen in the NICE guidelines on Antenatal care and by viewing the Screening timeline from www.screening.nhs.uk website. The links can be found in the Key Reading.

SUMMARY

- **Booking blood tests**, **discussion of screening options and information giving**
- **Sickle cell and Thalasseamia** (before 10 weeks)
- **Dating scan** (First trimester or otherwise if booked late)
- **Nuchal Translucency scan** (before 13 weeks, 6 days); the thickness of the fluid at the back of the neck is measured. Measuring the thickness of the fetal nuchal translucency (NT) between 11 to 13 + 6 weeks is an effective way to screen for chromosomal defects and is part of the combined test along with beta human chorionic gonadotrophin (HcG) and pregnancy associated plasma protein A (PAPP-A). Increased NT (> 2.5mm) has also been associated with cardiac defects as well as numerous fetal malformations and genetic syndromes (Atzei et al, 2006).
- **Screening serum for alpha-feto protein (AFP) and other 'markers'** after week 15. Neural tube defects - spina bifida and anencephaly can be detected by estimating the concentration of AFP in the maternal blood. The test is most accurate if carried out between 15 / 16 and 20 weeks of pregnancy.

If the woman has had any bleeding during pregnancy or if she has a multiple pregnancy then the test results are likely to be inaccurate. Raised levels of maternal serum alpha feto protein are associated with exomphalos, gastroschisis and neural tube defects. Low AFP is associated with Down's syndrome. The triple test is used as a screening test for Down's syndrome and involves taking a sample of maternal blood and estimating the levels of AFP, human chorionic gonadotrophin (HcG) and unconjugated oestriols (Ue3). The levels of these markers, together with maternal age, are used to calculate a risk factor for the pregnancy.

- **Anomaly Scan (18-21 weeks**). Ultrasound can be used to help identify fetal abnormalities, assess /measure fetal growth and to assist in invasive procedures. The 'routine' ultrasound scan that many women have is very basic and will only identify gross structural abnormalities. If it is thought that the fetus is at risk of having a structural abnormality then a more detailed anomaly scan can be carried out. An experienced operator and sophisticated ultrasound machinery can even detect cleft lips and count the fingers and toes of a fetus.

- **Repeat blood tests** (Haemoglobin, atypical antibodies) in the third trimester.

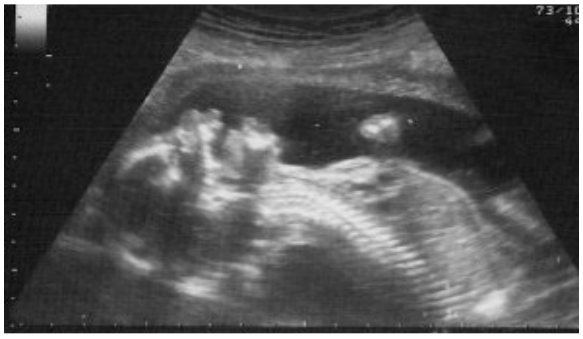
- **Routine antenatal maternal checks** – e.g. blood pressure, urine, abdominal palpation & measurement

- **SCREENING that is not 'routine' but based on Risk factors**

Additional /third trimester scans - to check for fetal growth, placental position, amniotic fluid and any other problem that may have been identified earlier in pregnancy OR in known 'risk' cases – for example multiple pregnancies, low lying placenta, maternal illness

Placental Doppler scan- to check placental blood flow in the case of pregnancy induced hypertension / placental insufficiency/ fetal growth restriction

Screening in high risk cases for Diabetes in pregnancy, Group B Streptococcus infection



Screening means that the tests cannot be used on their own to diagnose an abnormality because they may identify both false negatives or false positives; that is, fetuses who are identified as low risk but *do* actually have a specific condition (false negative) OR those that are completely unaffected but are identified as high risk (false positive). These terms should be explained to parents along with information about all options available to them. If the screening test indicates that there is a possibility that the fetus may have an abnormality, then a diagnostic test can be carried out.

Screening and / or diagnostic testing is *offered* to women but it is not mandatory that they accept either. Many factors including social, cultural and religious considerations may influence the decision making around uptake of screening, options around whether to go for further testing and following diagnosis of a fetal abnormality should this occur.

Diagnostic tests

If a woman is identified as high risk, then there are various options to gain a diagnosis and confirm the positive screening result. A detailed ultrasound scan can be used to check for structural defects for example spina bifida and cardiac disorders. Amniocentesis (Figure 1) involves passing a fine needle through the abdominal wall into the uterus and aspirating some of the fluid surrounding the fetus. The amniotic fluid contains fetal cells and these are cultured so that the chromosomes can be examined and abnormalities identified.

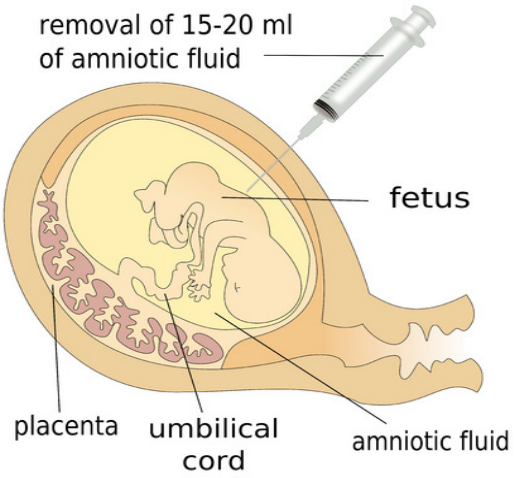


FIGURE 1: AMNIOCENTESIS © FabioConcetta | Dreamstime.com

Chorionic villus sampling involves aspirating some of the placental tissue by passing a needle or plastic tube through the vagina or abdominal wall into the uterus. The tissue cells are then examined to establish if there are any fetal DNA or chromosomal abnormalities.

Cordocentesis is similar to amniocentesis, where a needle is passed through the abdominal wall into the uterus. Once this is done a fine cannula is then sited in an umbilical vessel. Blood can then be taken from the fetus. If necessary, an intra uterine transfusion can also be carried out.

Chorionic villus sampling, amniocentesis and cordocentesis are all associated with a degree of risk to the fetus. Sometimes the woman may miscarry due to infection or the disruption of the internal uterine environment. Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.

Women who require 'additional' care

Risk status can also be allocated to women with additional needs during pregnancy. The latest NICE Guideline identifies such needs as: cardiac disease, renal disease, diabetes requiring insulin, psychiatric disorders, haematological / auto immune disorders, epilepsy requiring anticonvulsants, mothers who are using recreational drugs, HIV positive mothers, obesity (body mass index > 30) or underweight (<18 BMI), vulnerable groups such as teenagers and those with a higher risk of complications (over age of 40, smokers). Refer to the National Institute for Health and Clinical Excellence (NICE) Guideline on Antenatal care in Key Reading for further information

Diagnosing a problem in pregnancy

When a problem in pregnancy is diagnosed, it is essential that the parents have access to appropriate specialist support and advice. This may involve genetic counselling or meeting with a paediatrician who specialises in particular disorders. This will help them understand what the disorder /abnormality will mean for the neonate and what the long term outcome could be.

Risk associated with complications in pregnancy

Women who give birth to neonates who require admission to a Neonatal Unit are more likely to have had complicated pregnancies and are more likely to describe the births as 'difficult'. This means that many of the women with whom we have contact while their neonate is in Special / Intensive Care are likely to have experienced problems at some time during their pregnancy and this may mean that they require additional support and care after the birth.

Some maternal illnesses can cause the fetus to become compromised. They may then need to be delivered prematurely or may encounter problems after birth as a result of the following complications. In addition, identifying problems and risk during pregnancy leads to closer monitoring of the mother and fetus to guard against any further problems developing and so that the pregnancy and labour can be planned most effectively to safeguard both mother and fetus as well as optimise the condition of the neonate at and after birth.

Antepartum haemorrhage; If the placenta becomes detached from the wall of the uterus (placental abruption) then the life of the woman and the neonate may be at risk. Placental abruption can lead to intrauterine hypoxia and massive haemorrhage. If the haemorrhage is severe, then an emergency Caesarean section will be carried out.

If the placenta is located in the lower part of the uterus it is known as a placenta praevia (Figure 2). If it is very near or covering the cervix then the mother will bleed profusely when the cervix starts to open. Women with a very low lying placenta will usually have further scans in the third trimester and, if the placenta remains in a dangerous position, an elective caesarean section is done to prevent maternal and fetal compromise. Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.

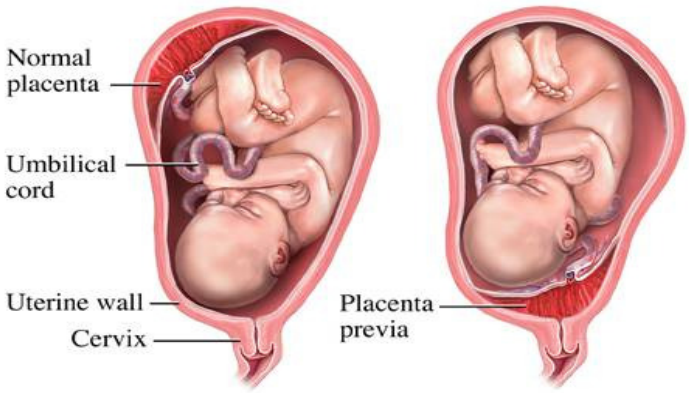


FIGURE 2; PLACENTA PREVIA http://commons.wikimedia.org

Pregnancy induced hypertension (PIH) and Pre-Eclampsia; Pregnancy induced hypertension (PIH) can result in impaired blood flow to the placenta and fetus meaning that the fetus can become hypoxic and acidotic. Close monitoring must be carried out and growth scans done along with 'Doppler' scans of the placental blood flow to assess the extent of compromise to the fetus. Blood flow through the placenta should show a normal diastolic pressure (normal 'end diastolic flow') while compromise flow will show up as reduced / reversed / absent end diastolic flow. The latter conditions are potentially serious for the fetus and may require a planned delivery particularly if the fetus ceases to grow.

PIH is also part of the condition Pre-eclampsia, a medical condition developing from 20 weeks gestation in which hypertension arises in pregnancy in association with significant amounts of protein in the urine. Pre-eclampsia refers to a set of symptoms rather than any causative factor. While blood pressure elevation is the most visible sign of the disease, it involves generalised damage to the maternal endothelium, kidneys, and liver. Its progress differs among patients and there is no known cure leading to seizures and intracranial haemorrhage in the mother. In severe cases, the neonate has to be delivered prematurely to avoid endangering the life of the mother and in some cases, the mother is so ill that she requires to be cared for in an intensive care unit. This will mean that she is unable to visit her neonate for several days. It may also mean that her partner and family may be trying to divide their time between visiting the mother and the neonate.

The mother will appreciate having a photograph of her neonate while she is unable to visit. Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.

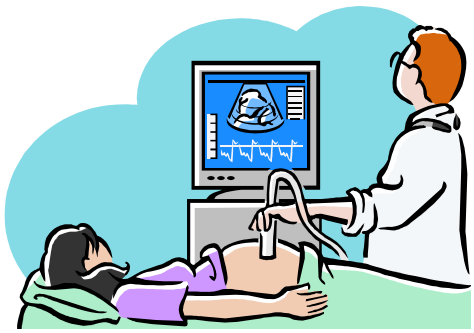
Gestational Diabetes Mellitus (GDM): Diabetes mellitus is caused by an inadequate amount of insulin being produced by the beta cells of the pancreas. This prevents the body metabolising glucose properly. During early pregnancy, increases in oestrogens, progestins, and other pregnancy-related hormones lead to lower glucose levels, promotion of fat deposition, delayed gastric emptying, and increased appetite. As gestation progresses, however, postprandial glucose levels steadily increase as insulin sensitivity steadily decreases. For glucose control to be maintained in pregnancy, it is necessary for maternal insulin secretion to increase sufficiently to counteract the fall in insulin sensitivity.

GDM occurs when there is insufficient insulin secretion to counteract the pregnancy-related decrease in insulin sensitivity. The condition can be controlled by regular injections of insulin.

Some women develop diabetes when they are pregnant. This is known as gestational diabetes and it usually disappears after the delivery of the neonate.

Screening for gestational diabetes using risk factors is recommended (See NICE Guidelines on Diabetes in Pregnancy) which should be identified at the booking appointment. These risk factors are BMI (>30), previous macrosomic neonate (>4.5kg), previous diabetes and family history along with family origin with a high prevalence of diabetes (South Asian, black Caribbean, Middle eastern). Women with any of these risks should be offered screening for gestational diabetes. The RCOG Guidelines on Diabetes in pregnancy along with the NICE Guidance discusses this condition in more detail.

Neonates of women who have diabetes mellitus have an increased risk of congenital abnormalities. They may also be larger than neonates of non - diabetic women which can cause problems at delivery if the neonate is too large to pass through the pelvis. The mother may need a caesarean section. Postnatally these neonates are at risk of developing hypoglycaemia and respiratory distress syndrome. This is covered in more detail in Unit 4 (Part 2).

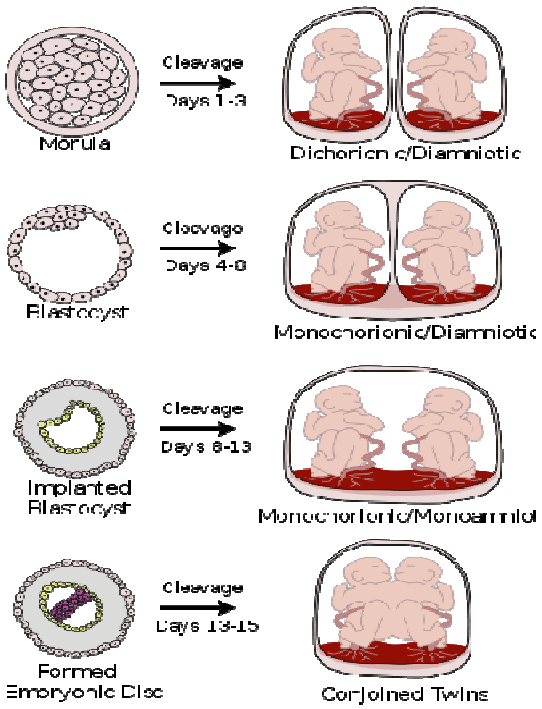


Poor Fetal growth: Growth restriction can be identified following ultrasound scan and this can be termed 'symmetrical' or 'asymmetrical' each with its varying causes – this will be covered in Unit 3E. If poor growth is identified, this will need to be closely monitored with later scans and follow –up.

Disorders of amniotic fluid- an increase or reduction in the normal volume of amniotic fluid may also indicate the need for further assessment and scanning (polyhydramnios or oligohydramnios). There should be approximately 300 ml at twenty weeks, 600 ml at 30 weeks and 1000mls at thirty-eight weeks (averages) http://www.pregnancybliss.com/amniotic_fluid.html.

Multiple pregnancy; This is associated with a higher chance of preterm labour and greater risk of low birth weight. This risk increases, the more fetuses there are and if the chorion is shared. Figure 3 shows the different types of twin pregnancies, depending on whether the twins have developed form the same zygote (identical) or different zygotes (non-identical). In addition, classification depends on whether they share an amnion and / or chorion. Non-identical, dichorionic multiple pregnancies are less at risk of problems with growth and preterm labour compared to identical, monochorionic multiples, although any multiple pregnancy of any form is known to place the fetus at higher risk than singletons. Overall, multiple pregnancy requires much closer monitoring and planning.

Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.



- **FIGURE 3; Twin pregnancy- overview of types**

http://commons.wikimedia.org/wiki/File:Placentation.svg Author Kevin Dufendach.

Twin to twin transfusion Syndrome (TTTS); As a result of sharing a single placenta, the blood supplies of monochorionic twin fetuses can become connected, so that they share blood circulation: although each fetus uses its own portion of the placenta, the connecting blood vessels within the placenta allow blood to pass from one twin to the other. One twin is the recipient of a higher proportion of blood supply becoming polycythaemic while the other does not receive sufficient blood and becomes anaemic (See Figure 4). Each of these situations will have its own associated problems and treatment and will be addressed in Unit 6 (Part 2).

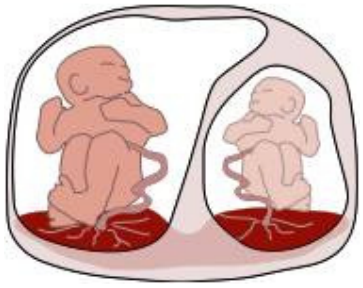


FIGURE 4; TTTS
http://commons.wikimedia.org/wiki/File:Twin_to_Twin_transfusion_syndrome.svg Author Kevin Dufendach.

Blood group incompatibility Haemolytic disease is the result of red blood cell antibody transfer from mother to fetus causing destruction of fetal red blood cells. Cell destruction is due to the antigen-antibody reaction. Rhesus incompatibility occurs when the mother's blood type is rhesus (rh) negative and her fetus's blood type is rh positive. Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.

While rh incompatibility has been rendered preventable, there are other blood groups which can cause the same disease; e.g. in ABO haemolytic disease of the newborn (ABO HDN), maternal IgG antibodies with specificity for the ABO blood group system pass through the placenta to the fetal circulation where they can cause haemolysis of fetal red blood cells which can lead to fetal anaemia, hydrops, HDN and pathological jaundice.

Infection; intrapartum/ infection of a prenatal origin can lead to significant risk to the developing fetus. Congenital infections include Toxoplasmosis, Varicella, Parvovirus, Cytomegalavirus (CMV), Rubella, and Herpes – all which can affect the developing fetus in the first trimester leading to serious consequences – this will be covered in more detail in Unit 4d (Part 2). A mother who is HIV positive needs to be given Zidovudine (AZT) as this is approved for use during pregnancy to help prevent the transmission of the HIV virus to the fetus.

Maternal infection may also be transmitted to the fetus later in pregnancy during the perinatal period (the period before, during, or after the time of birth). Any mother who has risk factors for infection (fever, urinary tract infection, prolonged rupture of membranes, foul liquor, raised CRP) may have chorioamnionitis. This refers to inflammation of the chorion and the amnion, and is associated with a bacterial infection. This may be due to bacteria; for example,

Group B Streptococcus (GBS) ascending from the mother's genital tract into the uterus to infect the membranes and the amniotic fluid. Chorioamnionitis can increase the risk of preterm labour. Antibiotics many be administered to the mother if she shows risk factors for infection.

As with Diabetes, screening is offered for Group B Streptococcus based on risk factors; e.g. signs of active infection in the mother, previous neonates with GBS; and is confirmed by a vaginal swab and / or urine testing. If GBS is confirmed, the mother will need treatment with antibiotics as this pathogen is potentially very serious for the unborn fetus and neonate. The RCOG Guidelines for GBS can be seen in the Key Reading.

Labour complications and their impact on the neonate

Cord compression; Anything that compresses the umbilical cord and prevents adequate blood supply to the fetus from the placenta will lead to hypoxia and poor perfusion.

Umbilical cord prolapse

This happens when the umbilical cord is in front of the presenting part. There is a risk that the cord may be compressed as the presenting part descends. This will cut off the placenta circulation to the fetus. It can be diagnosed on vaginal examination. The midwife may feel a rope like structure and they may feel the cord pulsating. They will try to avoid handling the cord as this can cause it to go into spasm. Instead they will try to push the presenting part off the cord with their fingers and ask the woman to go into the knee-chest position, with her bottom in the air.

The management will depend on the condition of the fetus and the stage of labour. If there is no fetal heart rate then the woman will deliver normally and the fetus will be stillborn. If there is a fetal heart rate and the woman is in early labour, then an emergency Caesarean section will be carried out. If the woman is almost ready to deliver, the neonate may be delivered with forceps; otherwise an emergency caesarean section will be carried out. At delivery, the neonate may require resuscitation if there has been significant compromise. Refer to the Royal College of Obstetricians and Gynaecologists (RCOG) Guideline in Key Reading for further information.

Shoulder dystocia

This happens when the fetus's shoulders become stuck and fail to deliver. The midwife will try to manoeuvre the woman into different positions to try to increase the pelvic outlet. They will also try to manipulate the newborn's shoulders to deliver them.

The longer it takes to deliver the neonate, the more asphyxiated they will become. The neonate will require resuscitation and may sustain long term cerebral damage. Sometimes the neonate may have damage to the brachial plexus or fractures of the clavicles as a result of the traction exerted at delivery.

Malpresentations such as breech

A breech presentation is when the fetus is positioned bottom first instead of head first. Sometimes a foot comes first. It can be diagnosed antenatally on abdominal palpation or it may be diagnosed in labour on vaginal examination.

It may be possible to convert a breech presentation to a cephalic presentation antenatally by using external cephalic version. This involves applying pressure to the abdomen and manually rotating the fetus. However, this is not always successful and the fetus may move back into the breech position.

If the neonate delivers vaginally by the breech then great care must be taken not to pull on the baby as this can cause damage to the internal organs. The head should be allowed to deliver slowly as a rapid delivery is associated with intracranial haemorrhage. There is a risk that the head may become entrapped or that the fetus may inhale meconium. This will cause asphyxia and the neonate will require resuscitation. Some neonates have extensive bruising or oedema of the genital area because of the pressure on the area during labour.

Difficult and / or prolonged labour; The fetus may become compromise during a prolonged second stage of labour which may lead to the them becoming 'stressed' or hypoxic over a course of time if labour does not progress. It may then be necessary to monitor the foetus more closely and augment labour to prevent any further hypoxia.

Prolonged rupture of membranes is when the mother's membranes rupture for longer than 24 hours prior to the onset of labour increasing the risk of ascending infection from the lower genital tract and bacteria have the ability to cross intact membranes. Congenital and perinatal infection has been discussed previously. Neonatal infection, including that which is perinatal in origin, is covered in further detail in Unit 4D (Part 2).

Preterm labour; A preterm baby is one who delivers before the 37th completed week of gestation. This important topic is covered in Unit 3E which covers the risk factors for preterm labour, prevention and significant issues relating to the care and outcome of neonates born at early gestations. Since preterm neonates comprise a large proportion of our patients in the neonatal unit, then this warrants a whole Unit dedicated to this in detail. This includes the issues around the low birth weight and / or growth restricted neonate

Post-term pregnancy Post maturity is when a baby has not yet been born after 42 weeks of gestation, two weeks beyond the normal 40. Post-term, post maturity, prolonged pregnancy and post-dates pregnancy all refer to post mature birth. Post-mature births do not have any harmful effects on the mother, but the fetus, however, can begin to suffer from the effects of placental function diminishing. After the 42nd week of gestation, the placenta, which supplies the baby with nutrients and oxygen from the mother, starts aging and will eventually fail.

Passage of meconium occurs more readily in a fetus that becomes 'stressed'; i.e. suffers a degree of hypoxia. Post-maturity is a factor that can increase the risk of meconium passage into the amniotic fluid prior or during labour which can be seen when the membranes rupture. Not all meconium if seen in the amniotic fluid necessarily constitutes a risk to the fetus – it is if the fetus becomes very hypoxic and inhales the meconium into the lungs (meconium aspiration), that risk to the newborn increases and this is covered in Unit 3D.

Operative and instrumental delivery and the impact on the neonate

Caesarean Section

Caesarean section may be elective (planned) or emergency. It can be carried out with general, epidural or regional anaesthesia. There is concern over the rising number of caesarean sections being carried out in England. The concern is related to the cost of the procedure and the risks to the mother and the neonate.

The main risks to the mother are associated with the use of anaesthesia - particularly general anaesthesia. Emergency caesarean sections are associated with higher mortality and morbidity than elective caesarean sections. Following the caesarean section, the women will require a longer recovery time and will need assistance in caring for herself and the neonate.

Neonates delivered by caesarean section are more likely to have Respiratory Distress Syndrome. This is more common in those delivered by elective caesarean section than those who have experienced labour. It is thought to be due to their inability to clear the fetal lung fluid at delivery and a delay in the normal release of surfactant. In rare cases, neonates have sustained lacerations caused by the scalpel.

Forceps delivery

Forceps are metal instruments used to expedite delivery of the fetus or rotate the head into a more favourable position for delivery. The main risks to the neonate are bruising or lacerations caused by the blades. Facial palsy may occur but this is usually temporary.

Ventouse or vacuum extraction

Vacuum extraction is used for similar reasons as forceps. It consists of a silicone cup and a vacuum system. The cup is applied to the fetus's head and the vacuum system creates a negative pressure. Traction is then applied to the cup to bring about the delivery of the neonate.

Trauma to the mother is less severe with the vacuum extractor than with forceps. The main risks to the baby are transient retinal haemorrhages and bruising to the scalp.

The extent of resuscitation and neonatal outcome of operative deliveries will depend on the degree of fetal hypoxia.

Active management of labour

One method of speeding up labour is to rupture the membranes (amniotomy). It is believed that the close application of the fetal presenting part to the cervix intensifies the contractions, making labour shorter. The risks associated with amniotomy are infection, decelerations of the fetal heart, umbilical cord prolapse and bleeding from the cervix.

Intravenous oxytocin is also used to speed up labour. It does this by stimulating uterine contractions. It can make them more frequent, longer and stronger. The main risks associated with intravenous oxytocin are uterine hyperstimulation resulting in fetal hypoxia and uterine rupture.

Fetal monitoring in labour

The normal fetal heart rate is 120 - 160 beats per minute. A very fast heart rate or a very slow one, or one that dips with contractions and takes a long time to recover may indicate a fetus that is in distress. During labour the uterine contractions cause the blood supply to the placenta to be interrupted intermittently. The blood supply is restored after the contraction passes. The result of this is that the fetus becomes progressively more hypoxic and acidotic. Healthy fetuses can withstand this and the process can help them make the transition from intrauterine to extrauterine life. A fetus that is already compromised because the placenta has been working inefficiently during pregnancy, for example, may become increasingly distressed. This fetus may die during labour or be born with hypoxic -ischaemic encephalopathy.

Over the past 20 years it has become increasingly common to monitor the fetal heart rate either intermittently using a wooden or metal stethoscope or with a hand held Doppler or by continuous electronic fetal heart rate monitors through the use of cardiotocography (CTG). The rationale for this was the assumption that cerebral palsy was caused by intrauterine hypoxia in labour. By monitoring the fetus intensively during labour, fetal distress could be diagnosed and the neonate delivered before irreversible damage was caused. There is considerable debate about the effectiveness of continuous electronic fetal monitoring in identifying foetuses at risk of hypoxia (There is evidence that the procedure results in an increase in the number of babies being delivered by caesarean section without reducing the number of babies who develop cerebral palsy. Therefore the NICE Guidance on Intra partum care (See Key reading) does not recommend the routine use of such monitoring. Refer to this guidance in Key reading for indication for use of electronic fetal monitoring (EFM) for measurement of the fetal heart rate (FHR).

Continuous electronic fetal heart rate monitoring is done externally with an ultrasound sensor placed on the woman's abdomen. At the same time a pressure transducer measures the length, strength and frequency of the contractions. There are four features of a CTG that can be classified:

- Baseline FHR: reassuring 110-160 beats per minute (bpm); non-reassuring 100-109 or 161-180 bpm; Abnormal less than 100 bpm, greater than 180 bpm or a sinusoidal pattern for more than 10 minutes.
- Variability: reassuring has more than 5 bpm; non-reassuring has less than 5 for 40-90 minutes; abnormal has less than 5 for more than 90 minutes.

- Decelerations: reassuring - none present; non-reassuring has typical variable decelerations with over 50% of contractions, occurring for over 90 minutes or a single prolonged deceleration for up to 3 minutes; abnormal has either atypical variable decelerations with over 50% of contractions or late decelerations, both for over 30 minutes or a single prolonged deceleration for more than 3 minutes.
- Accelerations: reassuring has accelerations present. However, the absence of accelerations with otherwise normal trace is of uncertain significance.

http://www.patient.co.uk/doctor/Intrapartum-Fetal-Monitoring.htm

If the heart rate monitoring suggests that the fetus is distressed, then fetal blood sampling can be used to confirm or refute the suspicion. A small sample of blood is taken from the scalp and analysed to assess the pH. A baby with a suspicious fetal heart rate pattern and a low pH would be delivered immediately while a baby with a normal pH can be allowed to continue in labour and reviewed at regular intervals. Fetal blood sampling appears to reduce the number of operative deliveries without compromising the health of the fetus. Interpretation of fetal blood pH sampling

Current NICE and RCOG guidance on appropriate responses to fetal scalp pH results is:

- pH ≥7.25 - repeat fetal blood sample (FBS) if cardiotocography (CTG) abnormalities persist.
- pH 7.21-7.24 - repeat FBS within 30 minutes or consider delivery if there has been a rapid fall in pH since the last sample.
- pH ≤7.20 - delivery is indicated.

Cord blood gas analysis during delivery is also undertaken to gain information about cause of fetal compromise. Having both venous and arterial blood gas values is useful in suspected or actual fetal hypoxia in that the umbilical vein reflects the blood gas from placenta before the blood gets to the fetus, whereas the umbilical artery values reflect the blood gas of the fetus. For example; the venous sample may be normal but the arterial one may not. Therefore, having both samples can then tell us the cause of the hypoxia or compromise – i.e. - is it at placental level or fetal in origin?

Norms for cord pH and partial pressure of oxygen are lower than neonatal values. The different values for venous and arterial normal values can be summarised as follows taken from Pomerance (2002);

	pH	**PCO_2**	**PO_2**	**Base Excess (BE)**
Venous =	7.28 – 7.35	5-6 kPa	3.8 -5 kPa	/-4
Arterial =	7.25 - 7.28	6.5 kPa	2.4 -3 kPa	/-4

Neonatal =

pH 7.35 – 7.45 / CO2 4-6 kPa / O2 6.5-10 (preterm) 6.5 – 12 (term) / Base excess / deficit + or - 4

(Averages. Citations differ slightly)

This Fact Sheet has discussed the implications of the 'high-risk' pregnancy and fetus in relation to how it affects the newborn baby. There is a wealth of current, national Guidelines in many specific aspects of this large topic which you should refer to in your background reading in order to familiarise yourself with essential evidence based rationale.

KEY READING

NICE (2007) Clinical Guidelines 55; Intrapartum Care of healthy women and their babies during childbirth The Quick Reference Guide is via the following link:
http://guidance.nice.org.uk/CG55/QuickRefGuide/pdf/English
http://guidance.nice.org.uk/CG55/Guidance/pdf/English

NICE (2008) Antenatal care Routine care for the healthy pregnant woman
http://guidance.nice.org.uk/CG62

http://www.nice.org.uk/nicemedia/live/11947/40110/40110.pdf
http://www.nice.org.uk/nicemedia/live/11947/40115/40115.pdf
http://www.nice.org.uk/nicemedia/live/11947/40145/40145.pdf

NICE (2008) Guideline on Gestational Diabetes-
http://www.nice.org.uk/nicemedia/pdf/CG063Guidance.pdf

RCOG Full list of Guidelines -
http://www.rcog.org.uk/guidelines?filter0%5B%5D=**ALL**

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