CHAPTER 1

1 Perinatal epidemiology and audit

Conception, embryonic and fetal development, parturition, and subsequent neonatal growth and development form a continuum. Obstetricians and neonatologists, however, have arbitrarily divided this continuum into rigid categories, which are used to audit standards of care during the perinatal and subsequent periods. Unfortunately, international agreement regarding some of the terminology is lacking; the definitions within this developmental continuum given here are those used in the UK and Australia.

Definitions (see also Fig. 1.1)

A live birth is one in which the infant shows signs of life (breathing, heartbeat or spontaneous movement) after its complete expulsion from the mother, irrespective of the gestational age or birthweight.

A stillbirth, or fetal death, is defined as an infant expelled from the birth canal at or after 24 weeks of pregnancy who shows no signs of life and has no heartbeat.

In Australia, stillbirth is defined as an infant born at or after 20 weeks' gestation and/or weighing ≥400 g with no signs of life. As the definition varies from country to country, comparisons of figures may be misleading. The stillbirth rate is expressed as the number of infants born dead at or after 24 weeks (or ≥20 weeks in some countries) per 1000 live births and stillbirths.

Gestational age This is calculated from the first day of the last normal menstrual period to the date of birth, and is expressed in completed weeks.

Term delivery occurs when the infant is born at or after 37 weeks' and before 42 weeks' gestation.

Preterm delivery occurs if the infant is born after less than 37 weeks' gestation. In the UK and Australia, 6–9% of infants are born preterm.

Post-term delivery occurs if the infant is born at or after 42 completed weeks of gestation. Approximately 1% of infants are born post-term.

Low birthweight (LBW) refers to any infant who weighs less than 2500 g at birth. In the UK and Australia, approximately 6% of live births are LBW. These infants are either born too early (preterm), or have grown inadequately in the uterus and are classed as 'small for gestational age'. Some LBW infants may be both preterm and small for gestational age.

Very low birthweight (VLBW) infants are those who weigh less than 1500 g at birth. Approximately 1–1.5% of liveborn infants are VLBW.

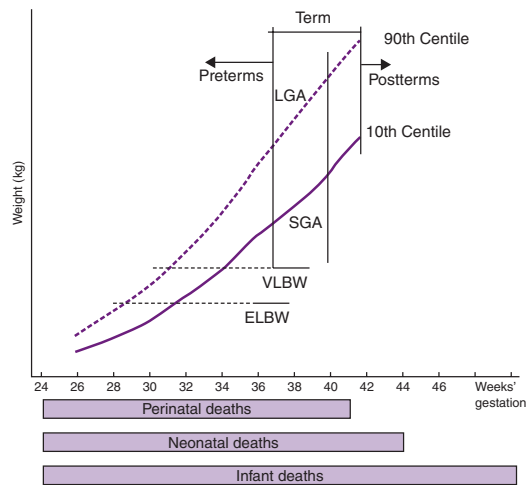

Figure 1.1 Definitions of terminology used in perinatal care (n.b. LGA: Large for Gestational Age).

Extremely low birthweight (ELBW) infants are those who weigh less than 1000 g at birth. This category accounts for approximately 0.7% of all births.

Small for gestational age (SGA). This term is generally synonymous with the fetus who has suffered intrauterine growth restriction (IUGR). Diagnosis depends on accurate assessment of gestational age (see p. 78) and plotting of weight on an appropriate growth chart. There is no international consensus on the definition of SGA, which varies from less than the 10th, 5th or 3rd percentiles, or more than two standard deviations below the mean birthweight. Accordingly, incidence figures will vary. In the UK SGA is defined as a baby weighing below the 10th centile for gestational age. Asymmetrical SGA refers to a baby whose weight is below the 10th centile, but whose head is above the 10th centile. This usually indicates late-onset intrauterine growth restriction (p. 84).

Changing trends

In order to make comparisons of death rates between years and across countries, some audit rates are widely used, but unfortunately the definitions may vary (see above).

Perinatal mortality rate (PMR)

$$\text{PMR} = \frac{\text{Number of stillbirths and neonatal deaths}}{\text{Number of stillbirths and live births}} \times 1000 \qquad (1.1)$$

For international comparisons, the rate refers to all births of at least 1000 g birthweight or, when birthweight is unavailable, of at least 28 weeks' gestation, and neonatal deaths occurring within 7 days of birth – as recommended by the World Health Organization (WHO).

For Australian national statistics, the PMR refers to all births ≥500 g birthweight or ≥22 weeks' gestation, and the neonatal period is up to day 28.

For the UK, the PMR refers to stillbirths ≥24 weeks and neonatal deaths in the first 7 days of life.

For Australian states, PMR refers to all births ≥400 g birthweight or ≥20 weeks' gestation, and the neonatal period is up to day 28.

Neonatal death rate in the UK and Australia refers to the number of deaths within 28 days of birth of any child who had evidence of life after birth. Birthweight and/or gestational age criteria apply as for PMR.

Neonatal death is death occurring within 28 days of birth in an infant whose birthweight was at least 500 g or, if the weight was not known, an infant born after at least 22 weeks' gestation.

Postneonatal death rate (or late infant deaths) refers to the number of deaths of liveborn infants dying after 28 days but before 1 year of age per 1000 live births.

Infant death is death occurring within 1 year of birth in a liveborn infant whose birthweight was at least 500 g, or at least 22 weeks' gestation if the birthweight was not known. This category includes neonatal deaths as defined above.

Infant mortality rate (IMR) *(per 1000 live births)*

$$\text{IMR} = \frac{\text{Number of neonatal deaths and postneonatal deaths}}{\text{Total live births}} \times 1000 \qquad (1.2)$$

Factors affecting perinatal death rates

Perinatal deaths relate to a wide variety of causes, sometimes arising as a result of maternal illness or problems of the fetus or newborn. In both the UK and Australia in 2004 the PMR was 8.2 per 1000 live births, comprising 67% fetal deaths and 33% neonatal deaths (Fig. 1.2). The highest risk groups were mothers aged <20 and ≥40 years, with PMRs of 12.0 per 1000 births. Social class is also an important factor. In the UK, there is almost a 100% difference in PMR between women in socioeconomic class I (professional groups) and those in class V (unskilled occupations).

The sex of the fetus or infant is also important. In Australia in 1993–95, the male perinatal death rate was 8.6 per 1000, as compared with 7.4 per 1000 for females. Maturity is of course an important factor in the PMR: about half of all deaths occur in babies who weigh less and of this group more than half weigh less than 1000 g. For twins the PMR is 4.3 times higher than for singletons. For higher order multiples it is nine times greater.

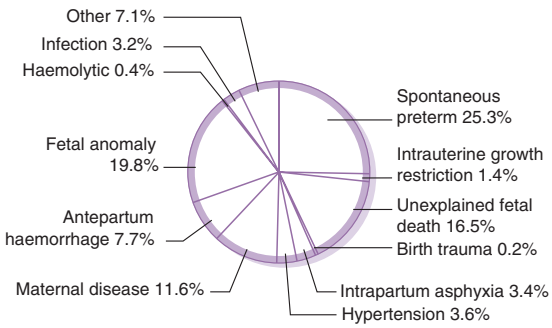

Figure 1.2 Causes of perinatal death, Queensland 1996. These proportions are similar to those in many parts of the UK.

Classification of perinatal deaths

It is difficult for doctors to agree on the cause of death in a diverse group of patients. Epidemiologists, obstetricians, neonatologists and pathologists may analyse deaths differently and report inconsistent rates. A traditional method for classifying perinatal deaths is based on the main maternal conditions or major obstetric antecedents.

The most reliable cause of death is obtained by an experienced perinatal pathologist conducting an autopsy examination, but even following such examination the precise cause of death may be undetermined, particularly when the infant dies before birth (see Fig. 1.2). For this reason, classification systems have been devised to identify the pathological processes occurring in the mother. A useful system is shown in Table 1.1.

The Perinatal Society of Australia and New Zealand (PSANZ) have developed the PSANZ Perinatal Death Classification (PSANZ-PDC) to identify the single most important factor leading to the chain of events resulting in a perinatal death, and the PSANZ-Neonatal Death Classification (PSANZ-NDC) to identify the single most important factor in the neonatal period that causes a death (Chan *et al*. 2004)

The role of the Coroner

Most jurisdictions have a Coroners Act that requires all reportable deaths to be reported to the Coroner. Usually a stillborn child is not reportable.

Table 1.1 Cause of perinatal death, Whitfield classification

1	*Spontaneous preterm* Multiple pregnancy Previous bleeding Previous spontaneous rupture of membranes Incompetent cervix Other Idiopathic
2	*IUGR*
3	*Unexplained IUFD*
4	*Birth trauma*
5	*Intrapartum asphyxia*
6	*Hypertension* Pre-eclampsia Renal Essential hypertension
7	*Maternal disease*
8	*Antepartum haemorrhage* Placental abruption Placenta praevia Undetermined origin
9	*Fetal abnormality* Chromosomal CNS CVS Renal Multiple malformations Metabolic errors Other
10	*Haemolytic disease* Rhesus incompatibility Other fetomaternal blood group incompatibility Haemoglobinopathy of α-thalassaemia
11	*Infection*
12	*Other*

Prevention of perinatal mortality and LBW

Despite not knowing the exact causes of perinatal mortality and LBW, the implementation of preventative measures can make substantial progress towards improving the outcome of pregnancy, as evidenced by the situation in developed countries

compared with developing countries. The factors that are known to reduce perinatal mortality and LBW include improvement in maternal health and education, reduction in unplanned pregnancy, and provision of prenatal care in a comprehensive and coordinated manner.

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Further reading

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