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National Maternity Data Development Project

Research brief **no. 9**

Timing of stillbirth

Fetal death refers to the death of a fetus during pregnancy (AIHW et al. 2014). In later stages of pregnancy, fetal death is known as stillbirth. The National Health Data Dictionary (NHDD) (AIHW 2012) defines stillbirth as:

> 'A fetal death prior to the complete expulsion or extraction from its mother of a product of conception of 20 or more completed weeks of gestation or of 400 g or more birthweight.'
>
> 'The death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as the beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.'

The death of a stillborn can occur in either the antepartum period (before labour) or in the intrapartum period (during labour, before birth). Death after birth (and up to 28 days post-birth) is known as neonatal death (AIHW et al. 2014). Stillbirths are strong indicators of quality of antenatal and obstetric care (Frøen et al. 2009). It is important to determine the time of stillbirth where possible to assist with understanding of the cause of death and to inform preventative management strategies, as well as help grieving parents to cope with their loss.

Alongside maternal mortality and severe morbidity, stillbirths were identified in the Maternity Services Review as an area where better data collection, analysis and review were needed (Commonwealth of Australia 2009). The review particularly highlights the 'limited understanding and magnitude of the problem' (Commonwealth of Australia 2009). The National Maternity Services Plan further recognises the surveillance of perinatal mortality as necessary to monitor the safety and quality of maternity care (AHMC 2011).

Worldwide, it is thought that stillbirths account for more than one-half of the world's perinatal deaths, but WHO reports that 90 countries worldwide lack any kind of data on stillbirths (Frøen et al. 2009; WHO 2006; WHO 2007).

Significance to maternal and perinatal morbidity and mortality

Many unexplained stillbirths occur in Australia (AIHW et al. 2014). In fact, the most common cause of stillbirth in New South Wales and Queensland for 2004–08 was unexplained antepartum death, at 1.7 and 2.0 deaths per 1,000 births respectively (AIHW et al. 2014). Stillbirths close to term are more likely to be classified as unexplained than very pre-term stillbirths (Gordon & Jeffrey 2008).

Current classification systems, thoroughness of investigation and the definition of stillbirth used may all contribute to a loss of important information on the cause of death (Flenady et al. 2009; Korteweg et al. 2007; Measey et al. 2007).

Understanding the causes of stillbirth is important, otherwise the potential for prevention strategies is diminished (including whether delivery should have been timed differently) (Flenady et al. 2009), and the potential to reduce stillbirth and perinatal mortality rates is limited (Preston et al. 2010). Further, health providers may find it challenging to counsel for future pregnancy management and risk, and families may find that a lack of cause has a negative impact on their grief and bereavement (Gordon et al. 2013).

Knowledge about timing of stillbirth is important because there are different implications for monitoring the quality of maternity care in each of these periods. Antepartum deaths may be associated with severe maternal, placental or fetal abnormalities (Gordon et al. 2013; Kramer et al. 2002; Spong et al. 2011), while intrapartum deaths can represent a failure in the quality of clinical care during delivery (Kramer et al. 2002). Collection of information on timing, in conjunction with other information, can contribute to management and prevention strategies and research. Adequate antenatal care can help to anticipate, treat and prevent adverse pregnancy outcomes.

Risk factors and causes

Stillbirth has consistently been associated with increased maternal age (particularly in women over 40 years of age), smoking during pregnancy, diabetes, hypertension and obesity (Flenady et al. 2011; Gordon et al. 2013; Wood et al. 2008). The increasing prevalence of these risk factors in pregnant women is said to contribute to the lack of significant decreases in stillbirth rates in developed countries over the last 10 to 20 years (Gordon et al. 2013; Reddy et al. 2010).

Further, it has been suggested that a number of stillbirths may be due to congenital abnormalities, genetic causes (particularly karyotypic abnormalities), and infection from bacterial, protozoal and viral sources (Silver et al. 2007; Spong et al. 2011). Infections are said to cause stillbirth through direct infection, placental damage, or severe maternal illness (Silver et al. 2007). Fetal-maternal haemorrhage has also been associated with up to 14% of stillbirths, and can occur in patients undergoing external cephalic version and caesarean sections, or with placental abruption and/or abdominal trauma during pregnancy or spontaneously (Pelikan et al. 2003; Petersson 2002; Silver et al. 2007).

Maternal recreational use of cocaine and marijuana during pregnancy has also been associated with stillbirth, primarily as a result of fetal growth restriction and/or abruption (Lutiger et al. 2005; Silver et al. 2007).

An increased risk of stillbirth has been said to be found in pregnancies after caesarean sections—however, this has not consistently been observed (Wood et al. 2008).

In relation to timing of stillbirth, it is well described in literature that the risk factors for antepartum and intrapartum stillbirth deaths differ (Pasupathy et al. 2009; Salihu et al. 2008).

Many of the above-listed factors, including increased maternal age, smoking, pre-existing hypertension and pre-existing diabetes, have been associated with antepartum stillbirths in particular (Gordon et al. 2013; Kramer et al. 2002). Gordon and others (2013) also found associations with antepartum stillbirths and nulliparity, area health service of residence and country of birth. Other associations include severe maternal, placental or fetal abnormalities (including umbilical cord complications, intrauterine growth restriction, and abruptio placentae) (Kramer et al. 2002). Many antepartum stillbirths occur without a known cause (Kramer et al. 2002).

While increased maternal age can be linked to intrapartum stillbirths, the link to antepartum stillbirths is thought to be much stronger (Salihu et al. 2008). This difference could be explained by higher rates of pre-eclampsia, chronic hypertension and abnormal placental conditions in older women (Salihu et al. 2008). Intrapartum deaths in older women may occur due to coexisting medical conditions, which may increase the risk of placental insufficiency and result in abnormal placental

function in labour, or may be due to dysfunctional myometrial contractility, resulting in risks of longer labour and operative delivery (Pasupathy et al. 2009).

Intrapartum stillbirths, in both high and low income countries, are more likely to be due to events that will only occur during labour and delivery, such as cord prolapse, birth trauma, intrapartum asphyxia and other specific complications, including fetal distress and obstructed labour (Salihu et al. 2008; Smith 2005; Frøen et al. 2009). Intrapartum stillbirth rates are thought to be a good indication of access and quality of clinical care during delivery (Kramer et al. 2002). Intrapartum stillbirths are more common in developing countries than developed countries, and can occur as frequently as 1 in every 100 births (Lawn et al. 2005). Deliveries in developing countries may occur at home, may be attended by an untrained traditional birth attendant, or may occur without access to emergency obstetric care (Kramer et al. 2002). It is thought that many of these deaths could be prevented with adequate obstetric care (Smith & Fretts 2007).

Most neonatal deaths (occurring within 28 days of birth) are thought to be due to congenital abnormalities, intrapartum events or the effects of prematurity (Smith 2005). However, some cases of intrapartum stillbirths and neonatal deaths can be linked to antepartum events, such as abruption or growth restriction (Smith 2005). Gestational age in these instances is a major determinant of the survival of the infant (Smith 2005).

Early delivery has been used to avoid stillbirth or fetal compromise (Spong et al. 2011). However, early delivery may put the newborn at risk of gestational age-dependent morbidities (such as respiratory distress syndrome, intraventricular haemorrhage, and hyperbilirubinemia), and mothers at increased risk of caesarean section, haemorrhage and infection (Spong et al. 2011). A decision on early delivery must be made with considerations of what is best for the mother and for the baby (Spong et al. 2011).

Prevalence/incidence, mortality and trends

Data from the AIHW *Australia's mothers and babies 2013—in brief* publication indicate that 2,191 stillbirths (of babies of at least 400 grams birthweight or gestational age of 20 weeks or more) were reported to the National Perinatal Data Collection in 2012, resulting in a stillbirth rate of 7 per 1,000 births (AIHW 2015). This is relatively consistent with published literature from other developed countries, including the United Kingdom (Smith & Fretts 2007) and the United States of America (Wood et al. 2008). Stillbirth rates are reported to have declined since the 1950s, but not to the same extent as neonatal deaths (Fretts 2005). This is suggested to be because of an incomplete understanding of the causes of most stillbirths (Cnattingius & Stephansson 2002; Wood et al. 2008).

National data on timing of stillbirth are not available (Hilder et al. 2014). However, Victorian data from 2011 show that of 367 stillborn babies of at least 20 weeks gestation or birthweight of at least 400 grams, and excluding terminations of pregnancy, 84.7% of deaths (311 deaths) occurred prior to labour, while 15.3% of deaths (56 of 367) occurred during labour (CCOPMM 2014). The data also showed that 10% (10) of the 100 stillbirths that occurred at more than 37 weeks' gestation were intrapartum deaths (CCOPMM 2014). These findings are relatively consistent with other literature, which suggest that 90% of stillbirths occur in the antepartum period (Pasupathy et al. 2009).

In 2011, 33 of 355 Victorian stillbirths considered were associated with 57 suspected contributing factors (CCOPMM 2014): 35 of the 57 factors were associated with antenatal care and monitoring; 18 with intrapartum care and management; and 4 with inadequate management of maternal conditions (CCOPMM 2014).

The prevalence of risk factors for stillbirth is also increasing in the Australian population. Salihu et al. (2008) report that maternal age of childbirth is increasing, elevating risks for adverse fetal outcomes, including stillbirth. In Australia, the average maternal age in 2013 was stated to be 30.1 years, an increase on 29.5 years in 2003 (AIHW 2015).

Other associated risk factors, including diabetes (AHMAC 2014; Hartling et al. 2012), hypertension (AHMAC 2012; Lowe et al. 2014) and obesity (McIntyre et al. 2012; WHO 2015), are said to be becoming more prevalent. Smoking rates reported by Australian Indigenous mothers during pregnancy are also high at 47% (AIHW 2015).

Data collection and analysis issues

Birth status (live birth or stillbirth) has been collected in the National Perinatal Data Collection (NPDC) since 1991 (AIHW: Hilder et al. 2014).

However, work undertaken for the National Maternity Services Plan revealed that stillbirth is defined differently across jurisdictions (Commonwealth of Australia 2009), with South Australia, for example, not recognising terminations of pregnancy as births (South Australia 2011), and other jurisdictions applying subtle differences to data when information about gestational age or birthweight is missing (Li et al. 2013).

Other stillbirth information is collected in some jurisdictions, though this is usually in different ways. Western Australia and Victoria collect timing of stillbirth information on their perinatal data collection forms, while Queensland collects this information on death registration forms collated by the Registrar of Births, Deaths and Marriages.

As there are often difficulties in determining the timing and cause of stillbirth, jurisdictional multidisciplinary review committees are tasked with assigning the cause of perinatal death, using a common system of classification, based on the most complete set of information available (AIHW et al. 2014). While the governance of these committees differs across jurisdictions, all jurisdictions have some form of statutory requirement to obtain and review sensitive data for this purpose (AIHW et al. 2014).

However, the jurisdictions review deaths in different ways. All jurisdictions, except for the Northern Territory, have committees convened by health authorities to review perinatal deaths. Perinatal deaths in the Northern Territory are reviewed by the Northern Territory Child Deaths Review and Prevention Committee. Further differences relate to which deaths are registered and reviewed by each jurisdiction. Queensland, for example, only reviews perinatal deaths of babies born in the state (AIHW 2014). No review would occur for a baby born in New South Wales, but who died in Queensland (AIHW 2014).

There is currently no routine collation of perinatal review committee data in conjunction with the Perinatal Data Collection, although New South Wales and the Australian Capital Territory undertook a special purpose linkage project for the AIHW, the *Stillbirths in Australia 1991–2009* report (AIHW: Hilder et al. 2014).

The classification systems for cause of death themselves can be problematic, with cause of stillbirth often not specified, or listed as 'unexplained' (Flenady et al. 2009). Classification systems such as the Perinatal Society of Australia and New Zealand (PSANZ) perinatal death classification provide more clinically relevant information and descriptions of perinatal death than the International Classification of Diseases and Related Conditions (ICD), and may facilitate classification of perinatal deaths (AIHW 2014a).

The precise time of death can be difficult to determine, particularly in the presence of maternal obesity, abdominal scars and oligohydramnios, where fetal movements, images and heart sounds may be harder to detect (Fretts 2005; RCOG 2010). Guidelines by the United Kingdom Royal College of Obstetricians and Gynaecologists suggest that real-time ultrasonography is essential for the accurate diagnosis of intrauterine stillbirth, rather than auscultation or cardiotocography (RCOG 2010). One study of auscultation found inaudible fetal heart sounds for 70 late pregnancies, though 22 were later discovered to be viable (RCOG 2010). Fetal movement alone is also not able to determine stillbirth, as some mothers may continue to experience (passive) fetal movement, even after the diagnosis of stillbirth (RCOG 2010).

Data development undertaken through the National Maternity Data Development Project

Timing of stillbirth is a clinical data item currently on the list of items to be actioned by the National Maternity Data Development Project (NMDDP), as part of the project's perinatal mortality work. See *Foundations for enhanced maternity data collection and reporting in Australia: National maternity data development project—Stage 1* (AIHW 2014b) for more information on the NMDDP.

At the February 2014 meeting of the NMDDP Clinical and Data Reference Group, members discussed the benefits and limitations of sourcing data from the NPDC versus the clinical review committees. It is expected that the most suitable source will be the clinical review committee data, as the data are of higher quality, can exclude termination of pregnancy, and will be timely.

The timing of stillbirth item will not become part of the Perinatal DSS for the NPDC, as the data are from a different source to the perinatal data collections. However, it is thought that a national standard, including definitions, response categories and a guide for use, should still be developed and added to the National Health Data Dictionary (AIHW 2012).

The item will stay on the agenda for national perinatal mortality reporting investigations. There may eventually be a National Minimum Data Set (NMDS) constructed for the purposes of reporting to a national perinatal mortality collection, and timing of stillbirth would be a relevant data element in this collection.

Importance of national collection of these data items

Data on timing of stillbirth will assist in understanding the cause of death, which will in turn assist families with their bereavement, and help to inform preventative management strategies, including improving the quality of antenatal maternity care, and care during labour.

The NMDDP aims to collate the data on timing of stillbirth from clinical review committees for this purpose. When all jurisdictions implement the new national standards, the collection and reporting of national data will assist in monitoring and reporting on stillbirths, and the associated causes.

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