

2. Invited Commentary: Reducing the Burden of Intrapartum Fetal Deaths

Intrapartum fetal death (IPD), the death of a fetus during labour is a tragic and traumatic outcome of pregnancy (1). Worldwide there is a substantial healthcare burden associated with IPD and it is estimated that approximately half of the 2.6 million stillbirths that occur each year are intrapartum (2). The number of IPDs occurring in high income countries may be small (0.3-0.7/1000 births) but each one leaves a profound impact, on both the parents and the involved healthcare professionals (2-4).

It is now accepted that the intrapartum death rate of an individual country or maternity unit is reflective of the care provided to both mothers and infants in labour, and that access to and utilisation of high quality, evidence-based intrapartum care is one way to further reduce intrapartum death rates (2, 3, 5-8). In-depth analysis of these cases will identify positive aspects of patient care, as well as point to areas of care that need to be improved upon (9).

The National Perinatal Epidemiology Centre (NPEC) collects and audits anonymised data on all stillbirths and neonatal deaths that occur each year in the Republic of Ireland (ROI). The dataset, which now contains over 400 discrete variables, represents the most complete and best quality data pertaining to all perinatal deaths in the ROI. This dataset provides the data for this review, which is based on analysis of data from 2011-2016.

Intrapartum Fetal Deaths in Ireland (2011-2016)

For the past number of years the IPD rate in the Republic of Ireland has remained static (10). There were 118 intrapartum deaths from 2011 to 2016 giving an overall IPD rate of 0.28 per 1000 births. When this is corrected for infants with a major congenital malformation, the rate is 0.16 per 1000 births.

Maternal Characteristics (n=118)

With respect to the 118 mothers, the mean maternal age was 31 years and the majority (98/118, 83.1%) were white Irish. At their booking visit 27/118 (23%) mothers smoked with over half (15/27, 55.5%) continuing to do so for the remainder of their pregnancy. The median BMI was 24.45kg/m² but 47 mothers (40.5%) were either overweight or obese. Gestational age at booking was known for 101/118 mothers with 29/101 (28.7%) mothers booking outside the World Health Organisations (WHO) recommended gestational age for booking of less than 16 weeks.

Labour commenced spontaneously in 69.5% (82/118) of mothers; 28.2% (34/118) had their labours induced while the remaining 2 underwent a pre-labour emergency CS. Table 2.1 details the mode of delivery for the 118 mothers in this cohort.

Table 2.1 Mode of delivery in intrapartum fetal deaths in Ireland: 2011 - 2016

Mode of Delivery	IPDs n=118 (%)
SVD	60 (50.8)
Vacuum	4 (3.4)
Forceps	6 (5.1)
AB delivery	34 (28.8)
CS pre-labour	2 (1.7)
CS after the onset of labour	12 (10.2)
Total	118 (100)

SVD Spontaneous vaginal delivery, AB delivery Assisted Breech Delivery, CS Caesarean Section

Fetal Characteristics (n=99)

The majority (110/118, 93.2%) of pregnancies were singleton pregnancies and there were more male infants (59) than female infants (57) in the cohort. Two IPDs were associated with infants of indeterminate sex. Gestational age of the infants who died was as expected with 2 distinct peaks occurring at opposite ends of the gestational age spectrum: forty-two deaths occurred less than 27+6 weeks of gestational age with a further forty-seven deaths occurring after 37 weeks of gestational age. Once infants with a major congenital malformation were excluded, however, the predominant gestational age range for the infants who died during labour was before 27+6 (39/65, 60%). The median birth weight for all infants was 1570g (range 320g – 4560g).

Normally Formed Intrapartum Deaths (n=65)

Of the 65 normally formed infants, 15 (26.8%) had a customised birth weight less than the 10th percentile for gestational age. Growth restriction was suspected antenatally for just 1 of these infants. Overall 16 infants were normally formed and had a gestational age over 37 weeks. When customised birth weight percentiles were calculated for these infants 4/16 (25%) measured less than the 10th percentile. This was not suspected antenatally for any of these infants.

Postnatal investigations

National and most international guidance now recommends the use of post-mortem examination and placental histology in all cases of stillbirth (11-13). In addition in the ROI any suspicious or “unnatural” death by law should be at the very least reported to the local Coroner. This includes all unexpected intrapartum deaths (11). Between 2011-2016, the post-mortem rate was 40.7% with a further 58.5% of parents being offered a post-mortem examination and declining. Coroner directed post-mortem examinations were conducted in 16.1% of cases. Post-mortem examinations were conducted on 31/65 (47.7%) of the normally formed infants.

Placental histology was available for 93.2% of IPDs. The NPEC does not collect data on whether cases were referred to the Coroner or not or why parents chose to decline a post-mortem examination for their infant.

Causes of death

Table 2.2 lists the main causes of death for all intrapartum deaths and I will now discuss some of these deaths in as much detail as the dataset allows. In total, 53/118 infants were diagnosed with a major congenital malformation and for all but one this was the documented cause of death. One infant was found to have Trisomy 21 on postmortem but the main cause of death reported to NPEC was severe chorioamnionitis.

Chorioamnionitis was reported as the main cause of death in 23 of the remaining infants. With the exception of two infants, all were born at a gestational age of less than 28 weeks. The first of the term infants died at 41 weeks of gestational age following a ventouse delivery. This was the infant that at postmortem was found to have trisomy 21. The second of these infants died following an induction of labour and ventouse delivery at 41+5 weeks gestational age. A hospital post-mortem examination was performed, and the cause of death was reported as severe chorioamnionitis and meconium aspiration with ensuing asphyxia. It was impossible to ascertain if chorioamnionitis was suspected during these mothers' labours or not.

Antepartum haemorrhage (APH) from a placental abruption was another relatively common cause of death, accounting for ten infants' deaths. Two infants died at term; the others were all less than 28 weeks of gestational age. One term infant was delivered by forceps after an induced labour at 37+6 weeks of gestation. A post-mortem examination was not undertaken but placental histology agreed with the clinical diagnosis of placental abruption. The second term infant was born via emergency CS after the onset of labour at 40 weeks of gestational age. This was a male infant, weighing 3355g at birth and this infant had a post-mortem examination conducted.

Intrapartum asphyxia accounted for ten of the intrapartum deaths. Coroner's Post-mortems were carried out in seven of the cases, a hospital post-mortem in one case and in the remaining two cases parents were offered post-mortem examinations but declined. The majority, (7/10) had some other contributing condition: Uterine rupture, premature prelabour rupture of the membranes (two cases), cord accident, placental lesion, maternal amniotic fluid embolism and fetal growth restriction.

With respect to the remaining cases, seven deaths were unexplained. Post-mortem examinations were conducted in six of the seven unexplained cases. A post-mortem was offered but declined by the parents in the seventh case. At the time of analysis one post-mortem report had not been entered into the dataset.

Table 2.2 Intrapartum main cause of death: 2011 - 2016

Cause of Death	Gestational Age at Delivery			Total (N=118)
	Less than 32 weeks	32-36 ⁺⁶ weeks	Greater than 37 weeks	
Major Congenital Malformation	8 (15.3%)	17 (32.7%)	27 (52%)	52 (100%)
Chorioamnionitis	21 (91.3%)	0	2 (8.7%)	23 (100%)
APH from placental abruption	8 (80%)	0	2 (20%)	10 (100%)
Intrapartum Asphyxia	3 (30%)	0	7 (70%)	10 (100%)
Unexplained	2 (33.3%)	0	4 (66.7%)	6 (100%)
Specific placental	2 (40%)	0	3 (60%)	5 (100%)
Mechanical	2 (66.6%)	0	1 (33.3%)	3 (100%)
Cord accident	0	1 (100%)	0	1 (100%)
APH from placenta praevia	2 (100%)	0	0	2 (100%)
Specific fetal, acute TTTS	0	1 (100%)	0	1 (100%)
Associated Obstetric Factors (PPROM)	4 (100%)	0	0	4 (100%)
Unexplained - PM Pending	0	0	1	1 (100%)

What do these findings represent and how can we reduce our intrapartum death rate further?

The corrected intrapartum fetal death rate of 0.12 per 1000 births in the ROI compares favourably with that of the United Kingdom (0.35) and other high-income countries (2, 14). In addition, the intrapartum death rate for normally formed infants greater than 37 weeks gestation is 0.04 per 1000 births. It is difficult to draw any real conclusion from these figures alone, however, given the differences in maternal demographics and definitions of stillbirth and intrapartum death that exist internationally (2).

It has also been recognised that in countries where women receive good quality intrapartum care, the proportion of intrapartum deaths is

less than 10% of all stillbirths (5). Since 2011 there have been 1,513 stillbirths in the ROI (3.6 per 1000 live births, uncorrected for major congenital malformations) and intrapartum deaths make up 7.8% of all cases. While these figures point towards good overall intrapartum care they are only numbers, and perhaps do not tell the full story.

Despite the limitations of the data, I believe there are lessons in this analysis for care. I offer four such suggestions relating to particular areas of maternity care. These suggestions are based upon my analysis of the NPEC data and are reflective of areas where appropriate clinical

improvement as well as financial investment may help to further reduce our intrapartum death rate. These suggestions will not be new or surprising, and for the most part echo points made in previous NPEC perinatal reports as well as the invited commentaries on stillbirth by Dr Keelin O'Donoghue and Professor Richard Greene (7, 15).

1. Improvement in Public Health Education

Maternal smoking, maternal obesity and late booking to a healthcare provider in pregnancy have previously been associated with all types of stillbirth, including intrapartum fetal death and adverse pregnancy outcome (2, 16-18). Analysis of the NPEC data revealed that 28% of mothers smoked, while 34% were either over-weight or obese. Almost one-third of the mothers who experienced an intrapartum fetal death booked late or not at all in their pregnancy. Despite ongoing efforts by maternity healthcare providers to improve antenatal education, unless there is significant engagement from the public, as well as acceptance of the risks associated with these lifestyle choices, these efforts will be futile. A recent study by Nuzum et al, which surveyed 999 respondents from the general Irish population, identified that over half of respondents failed to identify any risk factors for stillbirth (19). With this in mind I suggest the need for a greater public health awareness programme with respect to the benefits of healthy eating, exercise, obesity modification and smoking cessation prior to pregnancy. This awareness programme could also educate future parents on the complications of pregnancy such as stillbirth. This information is best imparted some-time pre-conceptually to enable potential parents to optimise their lifestyle pre pregnancy. I note with considerable enthusiasm the development of Physical Education as a school leaving cert subject and this may offer an opportunity for enhanced education with respect to some of these important modifiable lifestyle areas.

2. Improvement in Antenatal Recognition of Fetal Growth Restriction

Analysis of the NPEC dataset revealed that fetal growth restriction was present in over a quarter of the infants who died in labour and that this was antenatally suspected in just one case. Fetal growth restriction in utero is associated with perinatal death and consideration should be given to the use of customised growth centiles in order to aid accurate prediction of infants who do not meet their genetic growth potential (20-23). Identification of risk factors for fetal growth restriction is key and the subsequent management once it is identified may further reduce the risk of intrapartum fetal death (22, 24, 25). Reasons why growth restriction was missed so frequently is not something that is collected by the NPEC in individual cases but it is a finding that is not unique to Ireland. Enhancing education programmes for maternity healthcare providers to ensure a standardised approach to both risk factor identification as well as antenatal surveillance of fetal growth should be of vital importance for healthcare policy makers. In addition to this the onus is on all maternity healthcare professionals to equip themselves with the most up to date knowledge about the risk factors for fetal growth restriction to facilitate identification and appropriate interventions.

3. Perinatal Post-mortem Examination and Placental Histology

All international guidance (including Irish guidance) advocates for the routine use of post-mortem examination and placental histology when investigating all types of stillbirth (11, 13, 26). While placental histology was available in the majority of the cases I analysed (97.9%), according to the NPEC data less than one third of all intrapartum deaths were investigated with a post-mortem examination. Over half of parents were offered a post-mortem examination but declined. Of the normally formed infants in

this cohort, 61.2% did not have a post-mortem examination conducted. We cannot hope to reduce the Intrapartum Death Rate unless we have a thorough understanding of each individual intrapartum death and post-mortem examination is the gold standard investigation when searching for causality. It is unclear why so few infants had a perinatal post-mortem examination. One potential reason, in some hospitals, may have been lack of access to a dedicated perinatal pathologist. I echo the call made by the NPEC and Professor Greene in his invited commentary (7) for the development of a national perinatal pathology service. Such a service would provide equitable access for parents and healthcare providers to specialised perinatal pathologists irrespective of where the infant was born. It is to be hoped that this will be one of the priorities for the National Women and Infant's Health Programme to resource in 2018.

This does not explain, however, why some parents who were offered a post-mortem declined nor is that information available in the NPEC dataset. From the existing literature on parental decision making with respect to perinatal post-mortem, it is clear that the timing of the discussion in relation to post-mortem can impact on whether a parent consents or declines the examination. In general if parents are given more time to process the information in relation to post-mortem then they are more likely to consent (27). Another one of the perhaps modifiable reasons is in relation to the way parents are counselled towards post-mortem examination by health care professionals (28). It has been shown that when parents are counselled by appropriately trained senior healthcare professionals that consent is more likely to be obtained (29). In Ireland, few, if any of our senior medical or midwifery staff are appropriately trained in all aspects of bereavement care including how to consent for perinatal post-mortem examination (4). With the publication and now implementation of the National Standards for Bereavement Care following Pregnancy Loss and Perinatal Death(30); this area is finally being given due attention.

4. Development of a confidential enquiry into Intrapartum fetal death.

Analysis of the NPEC dataset revealed a number of interesting issues. I was able to identify risk factors for intrapartum death such as the relatively poor antenatal detection of fetal growth restriction, as well as high rates of maternal obesity and smoking. In addition it gave a very good insight into the reported causes of intrapartum death in the Republic of Ireland. I did not, however, have access to the mothers' or infants' maternity charts, and in particular the labour component. This meant that while I was able to document, for example, that eight infants died in labour secondary to intrapartum asphyxia it was not possible to conduct any analysis of these cases. It was, therefore, impossible to identify any good components or substandard aspects of maternity care or to postulate whether alterations in antenatal or intrapartum care would have made a difference to the outcomes.

For the last number of years, both in their annual reports and invited commentaries, the NPEC have been vocal in recommending that a Confidential Enquiry into Perinatal Death in Ireland be established. Confidential enquiries are a proven, validated, external case review process that have been used extensively in the United Kingdom (26) to investigate maternal death and more recently perinatal, fetal and infant death (14). They are an anonymised, non-judgemental and transparent review process that focus on both good aspects of care as well as identifying areas for improvement. Since 2009, maternity units in the Republic of Ireland through NPEC have been contributing to these maternal death enquiries but as of yet have not contributed to the perinatal death investigations (31). Development of a confidential enquiry system into all perinatal deaths, including intrapartum fetal deaths would provide learning at both local and national levels. While healthcare professionals have an obligation to provide high-quality evidence based care at all times (32), a confidential enquiry system will identify all areas in the patient journey that need to be improved,

including medical and lifestyle factors. There is undoubtedly currently a poor public perception of the Irish maternity services and a confidential enquiry system will further enable us to be clear and open with parents with respect to the review process and this might improve the public perception of how these cases are dealt with.

I suggest a confidential enquiry process into perinatal death alone misses an opportunity for learning, and any such process should also review the care received by infants who are born with a severe brain injury. Reviewing the intrapartum care provided to these infants has the potential to provide us with unique insights that may not be identifiable from analysis of perinatal deaths alone. The Each Baby Counts programme, supported by the Royal College of Obstetricians and Gynaecologists in the UK collects and pools

the results of local risk management reviews on the care received by infants who have died in labour, shortly after labour or who have suffered a severe brain injury at birth (33). In addition they have started assessing the quality of these local risk management reviews and to date have identified that almost one third (27%) did not contain enough clinical information to allow care to be appraised (9). With this in mind one further suggestion is that an Irish Confidential Enquiry System into Perinatal Deaths be extended to include those infants who suffer a severe brain injury. The optimal model would, therefore, be a national tool to facilitate a high quality enquiry in to all these cases. This tool could then be used at both local level, and be reviewed at hospital groups, and reviewed at a national level as necessary.

Conclusion

As maternity healthcare professionals we do a lot of good work on a day to day basis; much of it happens quietly and remains largely unseen. Sometimes, even with best care, serious adverse events such as intrapartum deaths do happen and not all are preventable. All need to be investigated, however. The data available from NPEC is good but there is an absolute need for Confidential Enquiries. There is still a lot to learn and a lot to be improved upon and in order to facilitate this we urgently need enhanced recognition, support and investment from healthcare policy makers. Investment to assist the learning suggested by this analysis could reap great dividends for the health service in fewer deaths and brain injuries around the time of birth. This would be a significant benefit for the parents and families who use our maternity services every day.

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