

CHAPTER 12

Other Indirect deaths

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Indirect deaths: key recommendations

See also the general recommendations in Chapter 13 Deaths from cancer.

Service provision

All pregnant women with medical conditions requiring treatment and care by other specialists should have an integrated care plan developed and agreed between all specialties involved. For some more common medical conditions, such as diabetes and epilepsy, joint clinics should be provided.

Regular communication between specialties is crucial and this should be monitored and ensured by the woman's lead maternity care provider, who will usually be her midwife.

Isolated maternity units without intensive care, advanced imaging and cardiology on site cannot look after sick women properly. There may even be a problem if hospitals are all on one site but an ambulance needs to be called for patients to be transported from one department to another. These facts must be taken into consideration, in terms of general healthcare planning and where to refer individual women with potential problems in pregnancy.

Pregnant women with complications must be seen early in pregnancy by consultant obstetricians. If the complications are outside the experience of the local obstetrician they should be referred to tertiary centres for a further opinion. This would not necessarily entail delivery at the tertiary centre.

Women admitted with medical or surgical complications outside the experience of their obstetrician should be managed jointly with consultant physicians or surgeons. This may necessitate moving them to a medical or surgical ward however great the pressure on these beds.

Sick pregnant women should be anaesthetised by consultant anaesthetists.

Individual practitioners

Pregnant women who are seriously ill from conditions not immediately related to pregnancy require exceptional care and routine referral patterns are not good enough for them.

Clear, relevant and complete information must be passed from the general practitioner to the antenatal care team, at booking, accurately detailing any past medical

history including previous malignancies, abnormal cervical smears, operations and any relevant family history.

When a woman says that she is or has been treated by an oncologist or any other consultant, such as a respiratory or cardiac physician, for an ongoing condition, these consultants should be contacted and up-to-date records made available. It should not be left to the woman to give her complete medical history or act as a go-between.

Pregnant women undergoing intercurrent treatment or investigation for medical or surgical conditions should be reviewed by a consultant obstetrician even though they may appear to be obstetrically well.

Women with persistent chest symptoms must be referred for specialist review. Chest X-rays should not be withheld because a woman is pregnant.

Introduction

Indirect maternal deaths are defined as deaths resulting from previously existing disease or disease which develops during pregnancy and which were not due to direct obstetric causes, but which were aggravated by physiological effects of pregnancy. Section One of this Report describes the definitions and categories of maternal deaths in more detail.

Examples of *Indirect* deaths include deaths from epilepsy, diabetes, cerebral haemorrhage and HIV infection. Cardiac causes of death are also classified as *Indirect* but, such is their importance, they have their own chapter in this Report. The international definitions of maternal death exclude deaths from suicide due to perinatal mental illness and those from hormone-dependant malignancies, both of which the UK Assessors consider to be linked to the woman's pregnancy. These causes of death also have their own separate chapters in this Report. The remaining deaths due to *Indirect* causes are counted and discussed in this chapter and are classified as *Other Indirect*. However, all these other causes of death also contribute to the overall *Indirect* mortality rate calculated for this Report.

Fifty years ago...

Death rates from associated causes, which include those now classified as either *Indirect* or *Coincidental* fell during the 1950s and 1960s. Because of better ascertainment, *Indirect* deaths rates are now higher than *Direct* death rates, as Figure 12.1 and Table 12.1 show. A more detailed description of time trends for *Indirect* deaths can be found in Chapter 22.

Table 12.1 shows the more recent changes in the number and rate of *Direct* and *Indirect* deaths for the United Kingdom since 1985. The *Direct* mortality rate has remained virtually static and it is the increase in *Indirect* mortality that has caused the overall increase in maternal mortality since 1993. The *Indirect* mortality rate for deaths reported to this Enquiry has been higher than the maternal death rates for deaths from *Direct* causes for the past two triennia. However, some of this increase may be attributable to increased reporting of these cases.

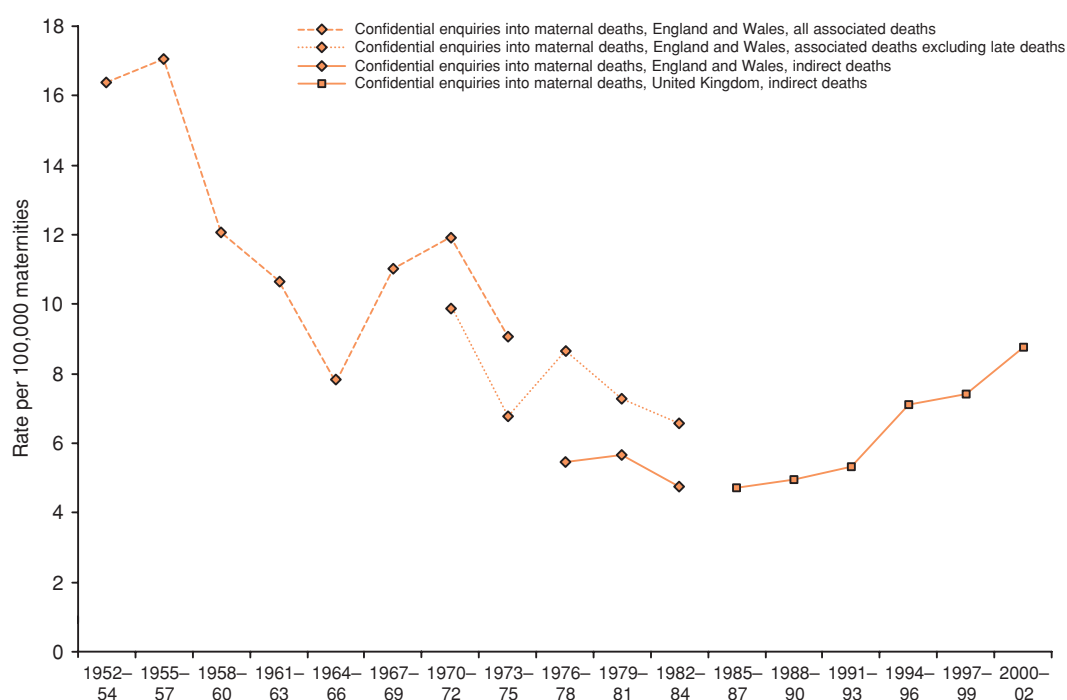


Figure 12.1 Maternal mortality rates for associated and *Indirect* deaths, per million maternities; England and Wales 1952–84, United Kingdom 1985–02

Part of the recent increase in *Indirect* mortality relates to an increase in cardiac mortality, as described in Chapter 10. This in turn is partly related to changes in the way that deaths have been classified as due to cardiac causes. *Indirect* deaths from suicide and cancer are now counted and discussed in Chapter 11 and Chapter 13, respectively. Some of these deaths and, in particular, deaths from suicide, are likely to have been under-reported in the early years. Since 1987, deaths from cancer, heart disease and suicide have all been rising but so too have deaths from all *Other Indirect* causes. As already indicated, the change in the definition of cardiac deaths as described in Chapter 10 would account for some of the rise in this category but such factors would not account for the rises in other causes of *Indirect* deaths, which are most likely due to better case ascertainment, particularly since the Office for National Statistics (ONS) has been able to identify more deaths from underlying causes coding, as discussed in Chapter 1. Nevertheless, the importance of all *Indirect* deaths as the major cause of maternal mortality which are often associated with substandard care should not be underestimated.

Table 12.1 *Direct* and *Indirect* deaths notified to the Enquiry and maternal mortality rates per 100 000 maternities; United Kingdom 1985–02

Type of death	Triennium											
	1985–87		1988–90		1991–93		1994–96		1997–99		2000–02	
	(n)	Rate	(n)	Rate	(n)	Rate	(n)	Rate	(n)	Rate	(n)	Rate
<i>Direct</i>	139	6.1	145	6.1	128	5.5	134	6.1	106	5.0	106	5.3
<i>Indirect</i> (all)	84	3.7	93	3.9	100	4.3	134	6.1	136	6.4	155	7.8
<i>Direct</i> and <i>Indirect</i> total	223	9.8	238	10.1*	228	9.8*	268	12.2	242	11.4	261	13.1
Total maternities	2,268,766		2,360,309		2,315,204		2,197,640		2,123,614		1,997,472	

* Figures do not add up because of rounding

Summary of cases for 2000–02

Table 12.1 shows that in 2000–02 there was a total of 90 *Other Indirect* deaths compared with 75 deaths in 1997–99 (Table 12.2). In some cases very few details were available to the assessors. Note that *Indirect* deaths from heart disease are counted in Chapter 10, those due to cancer are counted in Chapter 13 and those due to psychiatric causes are counted in Chapter 11. In addition, there were 18 deaths mentioned in this chapter but counted elsewhere.

Diseases of the central nervous system

Intracranial haemorrhage

There were 21 cases of intracranial haemorrhage, 17 due to subarachnoid haemorrhage and four to intracerebral haemorrhage.

Subarachnoid haemorrhage

The ages of the women with subarachnoid haemorrhage varied between 19 years and 39 years and were evenly distributed, with a mean of 32 years. In three cases the timing of bleeding in relation to stage of pregnancy was unknown. Four of the bleeds occurred antenatally, two in the first trimester and two in the third. No case occurred in labour; ten occurred after delivery at between 5 days and 4 weeks. Therefore, labour is unlikely to be a risk factor for subarachnoid haemorrhage. Seven of the bleeds were from aneurysm. In the other cases the source of bleeding is unknown. There were no cases of substandard care.

Table 12.2 Causes of *Other Indirect* deaths; United Kingdom 1997–02

Cause	1997–99	2000–02
Diseases of the central nervous system	34	40
Subarachnoid haemorrhage	11	17
Intracerebral haemorrhage	5	3
Cerebral thrombosis	5	4
Epilepsy	9	13
Other (see text for further details)	4	3
Infectious diseases	13	14
HIV	1	4
Other (see text for further details)	12	10
Diseases of the respiratory system	9	10
Asthma	5	5
Other (see text for further details)	4	5
Endocrine, metabolic and immunity disorders	6	7
Diabetes mellitus	4	3
Other (see text for further details)	2	4
Diseases of the gastrointestinal system	7	7
Intestinal obstruction	3	2
Pancreatitis	2	1
Other (see text for further details)	2	4
Diseases of the blood	4	2
Diseases of the circulatory system	2	3
Diseases of the renal system	0	3
Cause unknown	0	4
Total	75	90

It would not be surprising if pregnancy increased the risk of berry aneurysms bleeding, granted the general tendency noted below of blood vessels to aneurysmal dissection and bleeding at this time. However, the data to confirm this risk are not available and the effect cannot be marked, given the tendency for bleeding to occur sometime after delivery rather than during pregnancy itself.

Intracerebral haemorrhage

There were four deaths from intracerebral haemorrhage. There were no cases of substandard care.

Cerebral thromboembolism

There were four deaths from cerebral thromboembolism. Two occurred after delivery: one in a woman with borderline hypertension and the other in a known diabetic who had severe vascular disease. The following vignette provides an example the lessons that should be learned from such cases:

A woman developed headaches in early pregnancy, became unconscious and died the next day. She had had several previous deep vein thromboses and an operation for gangrenous bowel. Following an autopsy, death was certified due to cerebral infarction because of internal carotid artery thrombosis.

The consultant obstetrician reported she was seen just after booking and “all was well”. In view of her history, the assessors considered that she must have had some form of thrombophilia and consideration should have been given to thromboprophylaxis; indeed, this should have been discussed with her before she ever became pregnant.

Epilepsy

There were 13 deaths from epilepsy. Four cases met the criteria for sudden unexplained death in epilepsy (SUDEP) and a further five were possibly due to SUDEP. It is not known whether pregnancy increases the risk of SUDEP.

Deaths from SUDEP are always very distressing to all concerned. This distress is encapsulated by the comments of one woman’s midwife.

Aspiration of stomach contents during a seizure is another cause of death in women with epilepsy and was a factor in at least three of these deaths. A compounding factor is obesity, which made intubation difficult when one of these women with a BMI of 35 was admitted to hospital following a seizure during which she aspirated.

There is a conflict in the care of epilepsy in pregnancy. A reduction or cessation of therapy is probably better for the fetus. However, this does increase the risk of seizures and poorly controlled epilepsy increases the risk of SUDEP. Two women died having reduced or ceased anticonvulsant medication because of concern about its effect on the fetus. An example is given below:

A woman who died from epilepsy had attended the antenatal clinic a few weeks before, complaining of seizures five times per day. No action was taken by the obstetric staff. This represents substandard care. Ideally, all women with epilepsy should be looked after by specialist combined obstetric and medical or neurological teams in pregnancy.

It may be very difficult, however, to treat women effectively, even in a specialist clinic. For example, a young woman with difficult social circumstances and a history of alcohol abuse attended the antenatal clinic infrequently and missed many appointments. She was a known epileptic taking carbamazepine. In the third trimester she was found dead at home. It is likely that this was following a fit because there were teeth marks in her tongue. Care has to be classified as substandard because she attended so little and was not followed up in the community. However, it was clearly very difficult to persuade her to come more frequently and attendance even at a specialist obstetric medicine/epilepsy clinic might have made no difference to the outcome.

Miscellaneous central nervous system disease

One death may have been due to epilepsy but it is counted in the miscellaneous section as it was caused by skull fracture following a fall, despite excellent treatment at a national centre of excellence. She had been diagnosed with epilepsy during childhood and had only one seizure as an adult. She received prepregnancy counselling from a consultant neurologist before her first pregnancy and he advised discontinuing sodium valproate because of the fetal risks. An earlier pregnancy was uneventful apart from a single generalised seizure in the puerperium. She restarted sodium valproate and had no further seizures. Her consultant again advised stopping valproate and she had had no seizures since discontinuing therapy for some years before her last pregnancy.

This case precisely illustrates the difficulty of counselling women with mild epilepsy regarding medication in pregnancy. It is unclear whether her fall was caused by a fit. Most fits are not fatal. There is no doubt that sodium valproate carries risks for the fetus. However, the puerperium does seem to be a time when women are at risk, as this woman had already demonstrated. In retrospect it is easy to suggest that she should have taken a course of valproate after delivery but a carefully considered opinion to the contrary does not represent substandard care.

Infectious diseases

There were 14 deaths due to infection not arising from the genital tract. Genital tract infection is considered as a *Direct* death in Chapter 7. Three cases involved substandard care.

Bacterial infection

There were six deaths from bacterial infection, including three deaths from meningitis. One of the deaths from meningitis was due to the meningococcus and another to the pneumococcus. The pneumococcus also caused one fatality from pneumonia and there was one case of staphylococcal pneumonia possibly secondary to viral pneumonia. A sudden death at the end of pregnancy was initially unascertained but it is counted in this section because postmortem blood cultures grew *Clostridia sordelli*, making it likely that septicaemia was the cause. One death was in early pregnancy from bilateral mastitis. This is very rare. Since the woman died from staphylococcal septicaemia it is likely that a staphylococcus was the causative organism.

The key features of these deaths were as follows:

- As with deaths from genital tract sepsis, these cases were characterised by the speed with which the women died, despite appropriate treatment. All four women who

were admitted to hospital died within 2 days of admission, the majority within a few hours.

- Pregnancy may make women more susceptible to bacterial infection.
- In the case of meningococcal meningitis, the woman developed a rash; 2 days later she collapsed and was admitted and died soon after. Women with a rash that might be meningococcal should be treated with penicillin even before admission.
- Care was judged to be substandard in a woman who died of pneumonia. She attended her local accident and emergency department more than once with breathlessness and fever. She was eventually treated as if she had pulmonary embolism, for no good reason. The seriousness of her condition was not recognised until she was admitted to the maternity department, delivered of a dead baby and found to be in severe cardio-respiratory failure.
- In a case of mastitis, the junior doctors caring for the woman again did not appreciate the gravity of her condition. She was transferred to a hospital with gynaecology but no maternity unit without the knowledge of or consultation with senior staff. Advice from a consultant obstetrician was not sought until she was moribund in intensive care.

Fungal Infection

There was one death from aspergillosis. Aspergillosis usually occurs in immunocompromised patients. There was no evidence of this but the woman was emaciated at the time of her final admission. In retrospect, it was realised that she had been vomiting throughout pregnancy and this death may have been linked to her hyperemesis.

Viral infection

There were four deaths in this Report from HIV or AIDS and one in the last triennium; this is in marked contrast to the situation in some countries where AIDS is the leading *Indirect* cause of death in pregnancy. The following case illustrates the problems that women living with HIV/AIDS and their carers may face:

An immigrant HIV-positive woman whose parents had already died of AIDS became pregnant following rape in her own country. She was admitted to hospital because of abdominal pain and found to have tuberculosis and cryptococcal meningitis. A few days after admission she refused all treatment or food and wanted to die. Such was her physical condition that she was referred to the psychiatric team and she received parental nutrition. She then developed thrombocytopenia and coagulopathy. The pregnancy was terminated in the interests of maternal health but she still died a few days later.

This woman was in a state of hopeless despair. She was totally alienated and her organic brain syndrome would have made matters worse. She was treated with skill and compassion. It is difficult to see what more could have been done for her.

Another recent immigrant who died of tuberculosis refused HIV screening, although the clinical diagnosis seemed clear. Two further women died of rare but recognised complications due to antiretroviral therapy, lactic acidosis and acute liver failure. It is, however, possible that the latter woman had acute fatty liver of pregnancy but this could not be verified at autopsy.

Other probable deaths from infection

To add to the number of cases in this triennium where prompt and appropriate treatment was not available in accident and emergency departments, a woman who had a splenectomy in the past and who also had had previous meningococcal meningitis and pneumococcal septicaemia attended casualty with “gastrointestinal symptoms”. She waited for over 7 hours before she was eventually seen by a registrar who realised she was seriously ill. She subsequently miscarried and died later that day in the intensive care unit, probably from overwhelming sepsis.

As has already been commented on in other cases described elsewhere in this Report, the management of acutely ill pregnant women presenting to accident and emergency departments requires urgent review. She should not have been waiting so long only to be seen by junior staff when she was so seriously ill.

Diseases of the respiratory system

Asthma

There were five deaths from asthma. Asthma is still a life-threatening condition whether women are pregnant or not. One woman was not known to be pregnant by any healthcare attendants, including her general practitioner, before she was admitted to hospital in extremis in mid pregnancy. This case points to the need for ensuring that all women understand the need to book early in pregnancy and that booking is made as easy as possible.

Pneumonia, acute respiratory distress syndrome and fibrosing alveolitis

There were three deaths from pneumonia and one from adult respiratory distress syndrome. Care was substandard in one case of pneumonia because of a lack of intensive care beds. There was one death from fibrosing alveolitis.

Endocrine, metabolic and immunity disorders

This diverse group of conditions has been counted together for the sake of continuity with previous Reports. Some are discussed further here.

Diabetes

There were three deaths from diabetes and an additional death of a woman with diabetes from cerebral thrombosis has always been counted in this chapter, in the section on diseases of the central nervous system. The key learning points are summarised in the following table.

Deaths from diabetes; learning points

- All the maternal diabetic deaths were from hypoglycaemia or presumed hypoglycaemia. Hypoglycaemia has been the principal cause of death in diabetics in previous triennial Reports.
- There is no doubt about the benefit of good control in diabetic pregnancy. However, attempts to achieve this at the expense of recurrent maternal hypoglycaemia are misguided.

- In one case, care was judged substandard because the woman was not given glucagon by the paramedical team that was called to her home. This was because they were not informed about her diabetes.

Phaeochromocytoma

There were two deaths from phaeochromocytoma. This is a very rare tumour but it regularly results in a maternal death for one or two women in most triennia of this Report. The following vignette provides a typical example of such cases:

A multigravid woman developed hypertension and was admitted near term with headache, blood pressure 210/100 mm/Hg, 4+ proteinuria and 3+glycosuria. She was thought to have pre-eclampsia and labour was induced. Fetal bradycardia led to a 'crash' caesarean section. She was noted to have pulmonary oedema before anaesthesia and collapsed during surgery. She had several cardiac arrests in the intensive care unit and died a few hours later.

The feature that suggested that this was not a simple case of pre-eclampsia was the occurrence of such severe hypertension for the first time in a multigravida. Glycosuria was also a clue.

In another case, phaeochromocytoma had been discovered almost by chance when a computed tomography scan performed for a different reason showed a huge adrenal tumour. The major problem was hypotension. The autopsy showed marked contraction band necrosis in the heart.

Myocardial damage is a well-recognised complication of phaeochromocytoma. This is likely to have been a major cause of her hypotension although hypovolaemia (another complication of phaeochromocytoma) and which would have been exacerbated by her postpartum state was probably contributory.

Learning points: phaeochromocytoma

Although rare, phaeochromocytoma may present in pregnancy and is a regular cause of death in these Reports.

- Phaeochromocytoma should be excluded in multigravid women with severe hypertension with no previous history of pre-eclampsia.
- Glycosuria is a possible pointer towards phaeochromocytoma.
- Phaeochromocytoma can mimic all the features of pre-eclampsia.
- Myocardial damage is a well-recognised complication of phaeochromocytoma.

Disease of the gastrointestinal system

Intestinal obstruction, peritonitis, pancreatitis and ruptured oesophagus

There were three deaths from intestinal obstruction and/or perforation of the bowel. There was one death each from peritonitis, pancreatitis, a pancreatic cyst and

ruptured oesophagus. The following problems were identified in one or more of these cases:

- One woman was discharged early following caesarean section, despite a rising pulse and falling blood pressure and without medical review.
- One woman had been admitted in pregnancy with abdominal pain, given intravenous fluids and discharged with no diagnosis.
- In one woman, symptoms were incorrectly ascribed to her known mental illness and abnormal biochemical test results were ignored.
- A woman with known bowel disease never saw a consultant obstetrician until she was admitted and then only after a few days. She had a potentially serious surgical complication, intestinal obstruction, yet was managed on an antenatal ward where the staff lacked experience in managing this surgical problem. She was given multiple doses of pethidine over several days without any diagnosis having been made as to the cause of the obstruction. She was also given betamethasone in case early delivery should be necessary. These drugs probably masked the signs of peritonitis, which are often obscure in pregnancy in any case.
- There was a delay for another woman before she had surgery. While some of the delay could be ascribed to communication difficulties, it was mainly due to the fact she was on an isolated site and required an ambulance to take her for X-ray (and come back) and another ambulance then had to be booked for her to go for surgery. This is an example of the problems faced by isolated maternity hospitals or hospitals that are not designed to allow the easy transport of patients from one department to another.
- Extreme obesity (over 200 kg) in another woman was a factor causing delay in diagnosis and caused problems with venous access in another whose BMI was around 85.
- In one case the consultant anaesthetist did not attend, despite being informed of the anaesthetic difficulties that were expected.
- One woman had major pulmonary problems as a result of her illness. No tertiary thoracic centre was able to take her, even though her doctors spent many hours on the telephone trying to find a bed.

Diseases of the blood

There were two deaths from thrombotic thrombocytopenic purpura (TTP). A further death from haemolytic uraemic syndrome is described later in the section on renal disease. The following vignette provides several learning points:

Poor communication:

The GP gave no details of the woman's part obstetric history of several previous pregnancies complicated by fetal losses. This may be because he/she did not know them, as there were difficulties with translation. Communication was only possible by translating from one dialect to another via several family members. Nevertheless, it is difficult to believe that in previous pregnancies no warnings were given to her of the risk of subsequent confinements.

Failure to appreciate severity:

She booked late in the second trimester, which was a problem in itself. However, she should have been seen by senior consultant staff when she

booked rather than a GP specialist, in view of her appalling obstetric history. Indeed, given the rarity and severity of her condition she should have been referred to a specialist centre once its nature had been diagnosed.

Failure to identify and follow up abnormal test results:

A low platelet count in the third trimester was not noticed.

Her TTP was diagnosed late because the blood film was not examined and she was treated with immunoglobulin and platelet transfusion for presumed immune thrombocytopenia (ITP). In patients with TTP, treatment for ITP with immunoglobulin and platelet transfusion is known to make the condition worse, as happened in this case.

Disease of the circulatory system

There were three sudden and unpreventable deaths from a ruptured iliac artery, a ruptured pelvic vein and a possible ruptured spleen. The last case may have been due to a ruptured splenic artery aneurysm, which is relatively more common in pregnancy than in the nonpregnant state. Other deaths from heart disease and those relating to dissection of the aorta and its branches in the thorax are counted in Chapter 10 Cardiac disease. All these cases demonstrate the frailty of blood vessels in pregnancy. The following case illustrates the potential danger of pregnancy for all disorders of collagen, whether or not they have specific diagnoses:

A woman who died from ruptured iliac artery aneurysm had seen a rheumatologist who had diagnosed “benign joint hypermobility” due to a “benign” collagen disorder, a few years previously. This raises the possibility of Ehlers Danlos or Marfan’s syndromes, although she was thought to have none of the phenotypic features of these conditions at autopsy or presumably during life. Both Ehlers Danlos and Marfan’s syndromes are known to have a significant mortality in pregnancy.

Diseases of the renal system

There was one death from pyelonephritis, one from chronic renal failure and one from haemolytic uraemic syndrome. Lessons can be learned from all of these cases:

- Socially excluded or vulnerable women, including those known to social services, who regularly fail to attend antenatal appointments require outreach services and follow-up in the community. These women are at more risk of developing *Direct* or *Indirect* complications related to pregnancy.
- One woman died from complications of her renal disease on an obstetric ward and never saw a senior obstetrician, despite having been admitted for several days. Senior obstetric staff should personally review all sick patients.
- As already mentioned, women are dying of acute medical conditions without some midwifery or obstetric staff realising the serious nature of their problems. One of these women suffered a fatal cardiac arrest during anaesthesia because of multiple electrolyte disturbances secondary to undiagnosed chronic renal failure. She was known to be at risk of renal disease but no investigation had been made regarding her renal function at any time in pregnancy.

- The assessors are concerned that some current midwifery and obstetric staff do not have sufficient experience to recognise such sick patients as evidenced by the following example:

A woman miscarried at the end of the first trimester and about 2 weeks later was admitted with chest and epigastric pain. She was discharged with a significantly low platelet count. She was readmitted with fatal haemolytic uraemic syndrome, one of the features of which is thrombocytopenia. The low platelet count on her penultimate admission was either ignored or not seen. Had it been acted upon, she might have received treatment earlier and might have survived. This is a further example of a woman with problems outside the immediate framework of standard antenatal care.

- As in another cases in this Report, there were problems with resuscitation. One of these women suffered a cardiac arrest from which she could not be promptly resuscitated. This was due in part because the arrest team could not find either the patient or the defibrillator. Cardiac arrest drills must be practised in obstetric departments, particularly because cardiac arrest is an uncommon event.

Cases counted in other chapters

Some further cases from which lessons can be learned but which are counted in other chapters are discussed further to demonstrate key learning points.

Infection

The death of a woman from cerebral vein thrombosis (CVT) is counted in Chapter 2 Thromboembolism but mentioned here because she also probably had miliary tuberculosis, which would have increased her risk of CVT.

Endocrine, metabolic and immunity disorders

One woman who died from systemic lupus erythematosus has been counted in this chapter, but there are others in which immune disorders were predisposing factors. A woman whose undiagnosed autoimmune disease probably disposed her to sepsis died subsequent to chorioamnionitis. Her death is counted in Chapter 7 Sepsis. Two women with scleroderma and pulmonary hypertension are counted or discussed in Chapter 10, although one of these is a *Late* death, counted in Chapter 15, as is the death of a woman who developed cerebral lupus as part of a postpartum flare.

Disease of the blood

Lessons from the deaths of women with sickle cell disease (Hb SS) from myocardial fibrosis and Hb SC disease from pulmonary embolus are described in Chapter 10 and Chapter 2, respectively. The death of a woman from postpartum haemorrhage with factor XI deficiency is counted in Chapter 4 Haemorrhage.

Diseases of the central nervous system

Two *Late* deaths from epilepsy are counted in Chapter 15. Another death in a woman who suffered from epilepsy is counted as a death from substance abuse in Chapter 11.

A further death from cerebral haemorrhage is counted as a *Late* death and in one woman who was found to have Moya Moya disease, pre-eclampsia was thought to be the cause of death. This death is therefore counted as a *Direct* death in Chapter 3.

Renal disease

A woman who developed nephrotic syndrome in pregnancy is counted in Chapter 2 because she died from pulmonary embolism, having had inadequate thromboprophylaxis. Thromboembolism is a recognised complication of nephrotic syndrome.

Diseases of the respiratory system

A young woman developed pruritus in mid-pregnancy but her liver function tests were normal. A month later she was found to have a hydropic baby. Thalassaemia was excluded. She was transferred to a tertiary referral hospital and delivered by caesarean section of an anaemic baby in poor condition who died soon after. She quickly developed respiratory failure, which was unremitting. She died several weeks later so this is counted as a *Late* death, even though her fatal illness clearly started no later than the time of delivery; death was certified due to ARDS. At the relatives' request no autopsy of mother or fetus was performed. However, cytomegalovirus was found in the placenta and this may have been responsible for the death of the baby; perhaps the episode of pruritus represented a primary maternal infection. The reason why the mother developed ARDS is unclear. Although women with fetal hydrops and a large placenta may develop pre-eclampsia and women with pre-eclampsia may develop ARDS, there was no other evidence for pre-eclampsia in this case.

Chromosomal abnormalities

One of the *Direct* maternal deaths in this Report occurred in a woman with Turner's syndrome who underwent IVF treatment. Although this was probably not a major contributory factor in her case, the estimated risk of maternal mortality in women with this condition is 2% and four maternal deaths, one in a twin pregnancy and all due to aortic dissection, have been reported.¹ Women with Turner's syndrome need to be fully informed of the risks of pregnancy. They are usually of very short stature and careful consideration should be given to the additional risks of multiple pregnancy before replacing more than one embryo. Before contemplating pregnancy, screening for cardiovascular malformations should be performed. Pregnancy should be managed in a major centre with a multidisciplinary approach and facilities, and it is recommended that the aortic dimensions should be monitored carefully during pregnancy.

Conclusions

Recurring themes in this Report that are also highlighted by some of the cases in this chapter are summarised below.

Indirect deaths: key learning points

- Isolated maternity units without intensive care, advanced imaging and cardiology on site cannot look after sick women properly. There may even be a problem if hospitals are all on one site but an ambulance needs to be called for patients to be transported from one department to another. These facts must be taken into consideration both in terms of general healthcare planning and where to refer individual women with potential problems in pregnancy.
- Pregnant women with complications must be seen early in pregnancy by consultant obstetricians. If the complications are outside the experience of the local obstetrician, they should be referred to tertiary centres for a further opinion. This would not necessarily entail delivery at the tertiary centre.

- Women admitted with medical or surgical complications outside the experience of their obstetrician should be managed jointly with consultant physicians or surgeons. This may necessitate moving them to a medical or surgical ward, however great the pressure on these beds.
- Sick pregnant women should be anaesthetised by consultant anaesthetists.
- Tertiary units both in obstetrics and in medicine and surgery should be prepared to admit very sick women who have rare complications beyond the experience of their local hospital.
- Poor care has been given to pregnant women in accident and emergency departments. Women should not be discharged from accident and emergency departments without senior obstetric or midwifery review.
- Interpreters must be available for those who do not speak English. Family members should not be relied on. Their representation of both what the healthcare team and the woman are saying is likely to be biased.
- Tuberculosis is becoming increasingly common again particularly in immigrants whether or not they have HIV infection. Women with persistent chest symptoms must be referred for specialist review. Chest X-rays should not be withheld because a woman is pregnant.
- Pregnant women who are obese are at high risk in pregnancy and this risk should be made known to women in general.
- Pregnant women who do not attend antenatal clinic appointments are an at-risk group. Strenuous efforts must be made to contact them.
- It is very easy for abnormal pathology results to be ignored. Given the pressures under which most healthcare systems work, there is no easy solution to this problem except vigilance.
- From the cases assessed in this, and other chapters, it is clear there is too much pressure on intensive care unit beds.
- All women with epilepsy should be looked after by specialist combined obstetric and medical or neurological teams in pregnancy.
- Hyperemesis is a dangerous condition. It can cause severe malnutrition which can kill pregnant women.
- Blood vessels including pelvic blood vessels can rupture spontaneously in pregnancy.
- The assessors are concerned that some healthcare staff are not recognising medical conditions outside their immediate experience.

References

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