ORIGINAL ARTICLE

Sudden Maternal Deaths Probably Due to Obstetrical Pulmonary Embolism In Malaysia for 1991

J. Ravindran, MRCOG.
Department of Obstetrics and Gynaecology, Hospital Seremban, 70300 Seremban.

Summary

Obstetric pulmonary embolism forms the most serious vascular problem during pregnancy. The following report is a retrospective study into maternal deaths in Malaysian mothers probably due to obstetrical pulmonary embolism. Obstetric pulmonary embolism can be divided into amniotic fluid embolism and obstetric blood clot embolism. There were 37 maternal deaths attributable to this cause - 9.9 per cent of all maternal deaths to blood clot embolism and 6.7 per cent to amniotic fluid embolism. Most cases were diagnosed clinically because a postmortem examination was not done. Eleven cases of embolism were associated with Caesarian delivery. The typical profile of a Malaysian mother dying from obstetrical pulmonary embolism is that of a Malay mother in the "non-risk" parities of one to four and usually aged between 31 - 35 years. In the management of these patients, there should be an urgency in diagnosis and improvement in diagnostic procedures. Health staff at all levels should be trained to pick up patients who present with features of deep vein thrombosis.

Key words: Obstetrical pulmonary embolism, Amniotic fluid embolism, Blood clot embolism.

Introduction

Obstetrical pulmonary embolism includes two distinct clinical conditions - amniotic fluid embolism and obstetrical blood clot embolism under the International Classification of Diseases (ICD) 673. 1 and 673.2.

Thrombosis is the process by which liquid blood flowing through the vascular system turns into a solid mass of platelets, cells and fibrin within the blood vessel. The most serious vascular complication that arises during pregnancy or the puerperium is venous thrombosis and pulmonary embolism[1].

Since the majority of patients with pulmonary embolism die within one hour without diagnosis and treatment[2], it is obvious that the number of deaths will not be greatly reduced by improvements in treatment of the established condition. In particular, amniotic fluid embolism remains one of the most dangerous and untreatable conditions in obstetrics.

For the first time, it was possible to analyse the deaths that were classified as due to pulmonary embolism and amniotic fluid embolism that occurred among Malaysian women during childbirth. This article attempts to point the way towards improvement in the preventive and curative aspects of this disease.

Material and Methods

A process of confidential inquiry into maternal deaths was established by the Ministry of Heath, Malaysia. This was in response to a proposal by obstetricians, paediatricians, and maternal and child health officers following a meeting held in 1987. For the first time there was a comprehensive review of the investigative formats submitted by the various state authorities.

Any death of a woman while pregnant or within 42 days of termination of the pregnancy irrespective of the duration or site of the pregnancy, or from any causes related to or aggravated by the pregnancy or its management, were studied and investigated fully.

Maternal deaths were subclassifed into 'Direct' deaths resulting from obstetric complications of pregnancy, labour and puerperium; 'Indirect' deaths resulting from either a previous existing disease or from a disease which developed during pregnancy and which was aggravated by pregnancy and 'Fortuitous' deaths resulting from causes not related to or influenced by pregnancy.

The formats were filled in the narrative form and gave details about the course of events leading to maternal death, the category of personnel involved, the results of any investigative tests and any post-mortem report if done.

All identification data were removed at national level before the reports were analysed retrospectively by a national committee consisting of six obstetricians and gynaecologists, a senior physician, a senior anaesthetist, health administrative personnel and a nursing matron.

The national committee arrived at a consensus opinion as to the appropriate cause of death and coded them according to the International Classification of Diseases 9th ed.

Results

In 1991, there was a total of 252 deaths as compared to 194 in 1990, 248 in 1985 and 208 in 1980. The total deaths excluding fortuitous deaths in 1991 was 223. The increase in number of deaths in 1991 could be due to better data collection system in the hospital (See Figure 1).

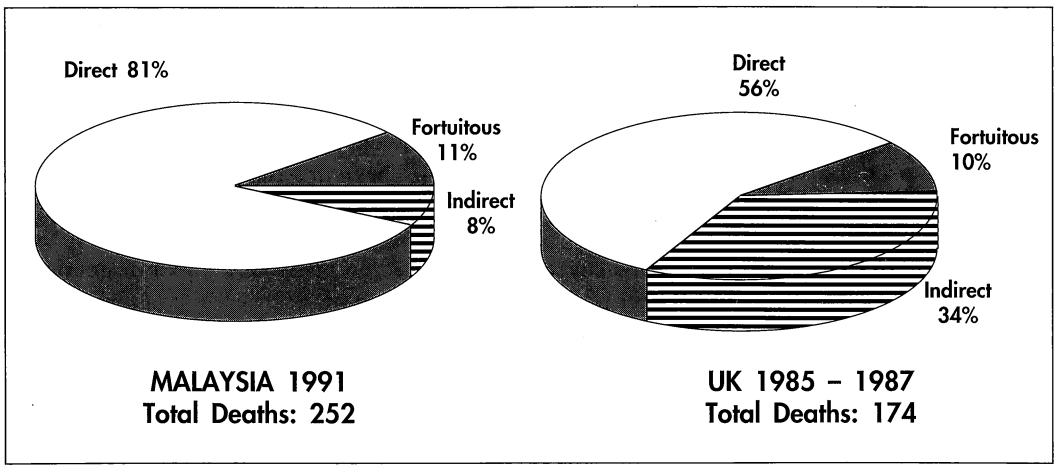

Fig. 1 : Maternal Death by Causes

There were 37 deaths attributable to obstetrical pulmonary embolism (18.2% of the maternal mortalities). Of these 15 deaths were due to amniotic fluid embolism.

The typical profile of the Malaysian mother dying from obstetrical pulmonary embolism is that of a Malay mother in the 'non-risk' parities of one to four, aged usually between 31 to 35 years (Figures 2, 3, 4)

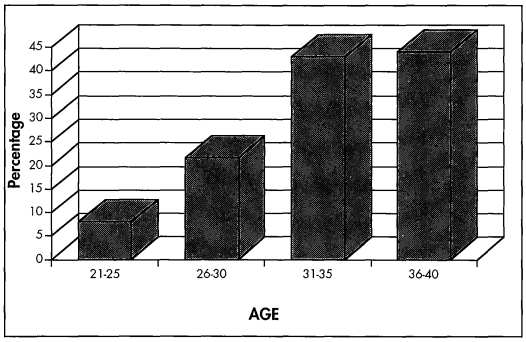

Fig. 2 : Age Distribution

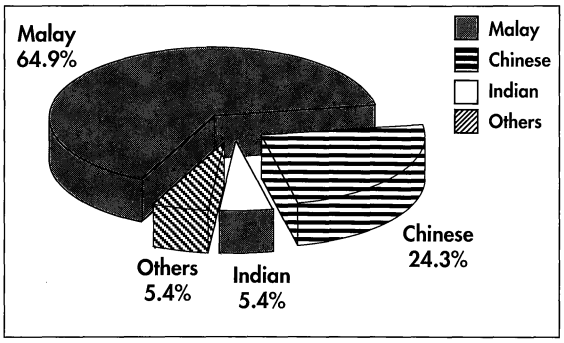

Fig. 3 : Race Distribution

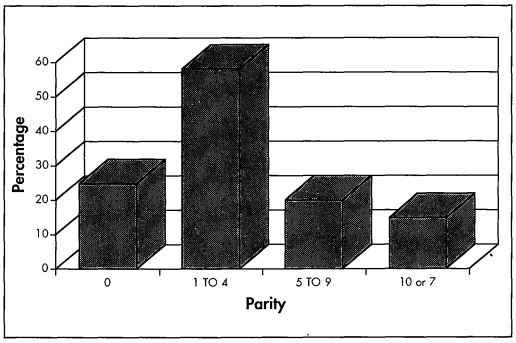

Fig. 4 : Death by Parity

It was possible to analyse the educational level of mothers, distance of home from the health facility, the place of delivery and the place of death from the data collected. The majority of mothers were educated up to secondary level (64.8%) although three (8.1%) of them were illiterate. More than half (20 mothers - 54.1%) stayed less than 5 km from a health facility. Only three of the mothers stayed more than 15 km from a health facility.

Six of the mothers who succumbed to suspected obstetrical pulmonary embolism died undelivered (16.2%). The majority delivered in General Hospitals with specialist facilities (14 mothers - 37.8%). Four of the mothers died during transfer from the place of delivery to the referral hospital reflecting the importance of stabilising the mother before transfer. Two of the deaths occurred in private hospitals accounting for 5.4 per cent of the mortalities.

The category of staff attending to the patients is shown in Table 1. Deliveries by untrained personnel accounted for only three of the deaths (8.1%).

Table I
Category of Staff at Delivery

Staff	No. of Cases	Percentage
Specialist	7	18.9%
Medical Officer	11	29.7%
Staff Nurse	5	13.5%
Midwives	5	13.5%
Village Midwife	2	5.4%
Others	1	2.7%
Undelivered	6	16.2%

Table II
Deaths by Mode of Delivery

Mode of Delivery	No. of Cases	Percentage
Normal Vaginal Delivery	14	37.8%
Forceps	1	2.7%
Vacuum	2	5.4%
Breech	1	2.7%
Abortion	1	2.7%
LSCS	12	32.4%
Undelivered	6	16.2%

Most patients had a normal vaginal delivery (Table 2). A relevant point is that 12 patients had a Caesarian delivery. Suspected embolism would have to be ruled out in any patient who collapses during surgery.

Thirteen of the patients died within 24 hours after delivery. The delivery - death interval was unknown in eight patients while six died undelivered.

A post-mortem normally would not have been performed in these patients. Only three of the cases had a post-mortem done. For 1991, only 19 cases had a post-mortem performed out of 252 maternal mortalities in this country.

Illustrative Cases

Case 1

A 22-year old Chinese primigravida had her first antenatal checkup at a private medical centre at 12 weeks of gestation. Regular follow-up had been uneventful.

She was admitted at 37 weeks in labour to the private medical centre. Artificial rupture of membranes was performed and pitocin started at 10.00am. She was cyanosed and dyspnoeic at around 12.30pm. A flying squad was summoned and she was sent to a General Hospital at 1.50pm. Resuscitation was unsuccessful and she died at 2.45pm. Death was due probably to amniotic fluid embolism.

Case 2

A 30-year old Iban primigravida had a total of six antenatal visits. A scan at 30 weeks revealed a low lying placenta. She rested in hospital till 38 weeks when a repeat scan showed a normally located placenta.

She was discharged and re-admitted in labour to the District Hospital. Spontaneous rupture of membranes occurred followed by generalised convulsions. She collapsed immediately. No post-mortem was done. Amniotic fluid embolism was diagnosed.

Case 3

A Chinese G4P2 was followed up in a private hospital antenatally. She went into labour at 38 weeks and artificial rupture of membranes was performed. She fainted two hours later and collapsed and could not be revived. A biopsy taken from the lungs was reported as showing evidence of amniotic fluid embolism.

Case 4

A 39-year old G6P5 with a past history of retained placenta was referred to a hospital at 34 weeks for pre-eclampsia. She refused admission and went home "at own risk". Follow-up home visits for a total of seven times failed to convince her for admission.

She was admitted in labour with pre-eclampsia and post-dates. By this time, intrauterine death had occurred. Pitocin augmentation was started but she failed to progress and a Caesarian section was performed. The mother developed wound infection and septicaemia and had a very stormy puerperium.

She was discharged after 12 days and died suddenly at home four days later. Death was considered to be due to pulmonary embolism.

Case 5

A 36-year old grandmultipara (G11P10) had a haemoglobin of 8 gm% at 26 weeks gestation. She was prescribed oral haematinics and Vit. B12 for a period of two months. The Hb improved slightly to 8.6 gm%. The patient fell unconscious in the bathroom and died at home at 34 weeks. A postmortem showed pulmonary embolism.

Case 6

A 26-year old G3P2 was referred from a health centre to a district hospital for the assessment of a cardiac murmur, thought to be a ventricular septal defect. The medical officer diagnosed a functional murmur.

She delivered in the district hospital and was discharged after two days with metoprolol which had been prescribed for an elevated blood pressure noted after delivery.

Subsequently, only one home postnatal visit could be made because of floods. On the seventh day, she complained of chest pain and shortness of breath and became cyanosed. A truck was arranged to take her to hospital through the floods but she died on arrival.

The cause of death was thought to be pulmonary embolism.

Discussion

This first comprehensive review of maternal deaths in Malaysia for the year 1991 revealed that 18.2% of all maternal mortalities was attributed to pulmonary embolism (10.8% to blood clot embolism and 7.6% to amniotic fluid embolism). Any subsequent discussion must take cognisance of the fact that only three out of the 37 mortalities discussed here were proven by post-mortem examination. The others were diagnosed clinically. This includes two cases where the diagnosis of acute myocardial infarction by the primary investigator was changed to obstetrical pulmonary embolism by the national review committee.

It used to be thought that pulmonary embolism was a rare occurrence in this country. However these findings being reported here warrant that the speciality take measures to ensure its reduction in our population.

All the women who died had no clinical evidence of deep vein thrombosis. None of the patients were on anticoagulant therapy in the antenatal period.

The risk factors for the development of thromboembolism are previous thromboembolism, obesity, immobilisation, operative devivery and a positive anticoagulant test[1].

Early ambulation of post-operative cases should remain a priority as a prophylactic measure in guarding against thrombosis. It is a cheap and effective way and only involves patient motivation.

Whilst recognising the fact that the ongoing Confidential Enquiries into Maternal Deaths in England and Wales are still unable to assess whether the use of subcutaneous heparin or antithromboembolic stockings has influenced the number of deaths due to lack of information on its frequency of use, the local specialists will have to consider prophylactic heparin and Dextran 70 infusion in high risk cases. In particular its use should be considered in the obese individual (> 70 kg.) undergoing an operative delivery[1]. An alternative method of estimating obesity is the body mass index or BMI[2]. (Body weight in kilograms divided by height in metres squared).

It will be appropriate for the Maternal and Child Health Division of the Ministry of Health to incorporate details of the weight at death, the preconception or booking weight, and the height of the patient to enable more precise analysis of this risk factor in future reviews.

Lupus anticoagulant remains an investigation that is available occasionally at the Institute of Medical Research in Kuala Lumpur. It should be made more widely available in the General Hospital to enable proper evaluation of risk factors to thromboembolism in the local population.

As pointed out earlier, a particularly glaring omission is the lack of post-mortem examination for

the majority of cases. This is due to many factors prevalent within the local context especially the socio-religious factors. Limited post-mortem should be considered, especially needle biopsy of the lungs. However, the interpretation of these can be misleading[3]. This review emphasizes that postmortem examination should be requested by the clinician and performed by pathologists to elucidate the correct cause of death. Muslim sensitivities dictate that a post-mortem examination can be performed as long as the cause of death is not known. Obstetricians and pathologists should try to ensure that a post-mortem examination is done as soon as possible within 24 hours of delivery. It is noteworthy that 13 of the 37 cases that occurred in 1991 expired within 24 hours of delivery. It may need to be considered that deaths occurring within 24 hours of delivery be made coroner's cases and existing legislation requiring a post-mortem examination be utilised to have these cases examined by a pathologist[4].

It has also been suggested that an electrocardiogram, serial cardiac enzymes and arterial blood gases are helpful tools for diagnosis of pulmonary thromboembolism[5].

There were 12 cases of embolism associated with Caesarian delivery. A capnometer would detect embolism by showing a sharp drop in the pCO2 reading. Ideally these should be available in every maternity operation theatre.

Since all hospitals do not have the same facilities and expertise, it is unrealistic to insist that all patients with venous thrombosis or suspected pulmonary embolism be investigated in an identical manner. In dealing with a particular patient, two factors should be considered: the urgency of diagnosis and the availability of diagnostic procedures.

Doppler examination has the benefit of being non-invasive and it can now be performed readily with most portable units. These provide a most useful adjunct to clinical examination as a bedside technique for detecting thrombotic occlusion in what is potentially the most hazardous site - the iliofemoral segment. These tests should be carried out in suspected cases in this country.

Lung scanning and venogram facilities though helpful carry their own drawbacks[6] and are not widely available in this country. Dependence on the clinical picture and a high degree of suspicion are the mainstays of diagnosis in this country.

Clinicians should realise that ideally for the pregnant woman, a clinical picture of venous thrombosis or pulmonary embolism should be confirmed by radionuclide venography and lung scanning. Where this is not available, contrast ascending phlebography protecting the gravid uterus is recommended. If phlebography is not available, the Doppler ultrasound technique should be used[3].

The characteristic clinical features of amniotic fluid embolism are sudden dyspnoea, hypoxia and hypotension. These features may be followed in minutes by cardiorespiratory arrest. In some cases grand mal seizures accompany the initial clinical events. An element of Adult Respiratory Distress Syndrome may be present. A haemorrhagic phase may accompany the initial haemodynamic disturbances or follow them if the woman survives the initial phase.

Until recently, confirmation of diagnosis could only be made at autopsy by finding histological evidence of amniotic fluid and foetal tissue within the substance of the maternal lung.

More recent techniques of diagnosis include detection of squamous cells and lanugo hair on cytological examination of blood aspirated through a Swan-Ganz catheter[9] and detection of squamous cells in

maternal sputum[10]. An awareness of these methods must be present among local obstetricians and pathologists. Although the sensitivity of these methods are debatable, they could be useful in this country where post-mortems are often not consented to.

Known risk factors for amniotic fluid embolism include age over 35 years, high parity, excessive or strong uterine contractions, the use of oxytocic drugs for induction or augmentation of labour, overdistension of uterus, complete or incomplete rupture of the uterus and intravascular coagulation[1].

Risk factors were noted in all except one of the cases (Table 3). Obstetricians have particularly to be wary of tetanic contractions following the use of prostaglandin and oxytocin in combination or in quick succession.

It should be stressed that the majority of women who have one or more of these factors present do not die in labour from amniotic fluid embolism. The purpose of mentioning these features is to stress that extra care may be appropriate for the women who have one or more of them.

Table III
Risk Factors for Amniotic Fluid Embolism

Case No.*	Risk Factors
1.	Exessive/strong uterine contractions with spontaneous ruptures of membranes.
2.	Use of oxytocic drug for augmentation of labour.
3.	Age > 35 years, augmentation of labour with pitocin, ARM.
4.	Precipitate labour with strong uterine contractions. (Home delivery in toilet.)
5.	No risk factors.
6.	Age > 35 years.
7.	Age > 35 years, LSCS done for big breech, intraoperative collapse.
8.	Grandmultipara, LSCS for foetal distress, intraoperative collapse.
9.	Age > 35 years, LSCS done for placenta praevia, intraoperative collapse.
10.	Polyhydramnios.
11.	Grandmultipara. Induced with prostin and subsequently augmented with pitocin.
12.	Tetanic contractions after cervagem pessaries used for induction of IUD.
13.	Augmentation of labour with pitocin.
14.	Grandmultipara, strong uterine contractions.
15.	Age > 35 years, tubal ligation.

* *Cases from narrative reports of maternal deaths submitted to Ministry Of Health National Technical Sub-committee to investigate maternal deaths.*

The bulk of postpartum care is provided by the public health service through midwives and rural nurses. Their training and checklists will have to include features indicative of possible deep vein thrombosis or pulmonary embolism.

All those involved in the care of pregnant or recently pregnant women should consider pain in the leg, pain in the chest or dyspnoea in an otherwise healthy woman, to be due to thrombosis or pulmonary embolism, until proved otherwise, and ensure that the appropriate treatment is instituted.

Conclusion

Maternal deaths due to embolic phenomena are not an uncommon cause among Malaysian mothers dying during childbirth. It ranked third as the leading cause of death after haemorrhage and hypertensive disease in 1991.

Post-mortem examinations should be more widely done in order to elucidate the exact cause of death. In the meantime, medical personnel caring for the pregnant mother should be alert to the possible clues to the diagnosis and prophylactic measures in high risk patients.

Amniotic fluid embolism remains a difficult management problem. Obstetricians need to remain alert in the use of oxytocin and prostaglandin in high risk patients.

Acknowledgment

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