

## PAPERS AND ORIGINALS

## Perinatal mortality and morbidity associated with eclampsia

HELEN WIGHTMAN, BRYAN M HIBBARD, MICHAEL ROSEN

*British Medical Journal*, 1978, 2, 235-237

## Summary and conclusions

Out of all the women who were delivered in Cardiff maternity units during 1965-74, 43 developed eclampsia, an incidence of 72/100 000 deliveries. The incidence in residents of Cardiff was 53/100 000 deliveries. None of the mothers with eclampsia died, but 10 of the 47 babies were lost, all but one having been born to women with antepartum eclampsia. The perinatal deaths were mainly associated with chronic placental insufficiency and preterm delivery. The extent to which the wide range of complex drug regimens used influenced perinatal outcome is not clear, although polypharmacy should be avoided.

Because eclampsia is rare we advocate that its management should be planned and rehearsed and that a simple, standardised treatment regimen should be used. Failing placental function may be detected by monitoring fetal growth by ultrasound.

## Introduction

During the past thirty years there have been many innovations in the management of eclampsia in the UK and various drugs have become available. Nevertheless, maternal and fetal mortality and morbidity are still high, about one in 12 maternal deaths being attributable to eclampsia. The incidence of 12.5 deaths from eclampsia per million deliveries in England and Wales in 1970-2<sup>1</sup> was little better than that of 15.7 in 1961-3.<sup>2</sup> No detailed study of the morbidity and mortality associated with

eclampsia occurring in maternity units in the UK has been reported since 1949,<sup>3</sup> when maternal deaths from eclampsia exceeded 50/million deliveries and fetal survival was a less dominant issue. We therefore carried out a retrospective survey of births in Cardiff during 1965-74 to review patterns of management and determine the incidence of maternal and fetal complications.

## Methods

The Cardiff Births Survey records details of all births in Cardiff and to residents of Cardiff. We identified all cases of eclampsia occurring in Cardiff during 1965-74 and retrieved the case records for study. Two patients, whose records could not be traced, were interviewed by one of us (HW). During the 10 years 59 789 women were delivered in Cardiff; of these, 43 046 were Cardiff residents.

## Results

*Incidence*—During the study period 43 women developed eclampsia; only 23 of these were Cardiff residents, the others being selected high-risk patients and flying-squad admissions from adjacent areas. The overall incidence of eclampsia in Cardiff residents was 53/100 000 deliveries, and although the incidence was higher in the first quinquennium than the second, the difference was not significant (table I). The following analyses relate to all births in Cardiff. On reviewing the cases we found only three in which the diagnosis of eclampsia was questionable. In two of these epilepsy was subsequently diagnosed,

TABLE I—Incidence of eclampsia in all women delivered in Cardiff during 1965-74 and in residents of Cardiff delivered during this period

	All women delivered in Cardiff			Residents delivered in Cardiff		
	No of deliveries	No with eclampsia	Incidence of eclampsia /100 000 deliveries	No of deliveries	No with eclampsia	Incidence of eclampsia /100 000 deliveries
1965-9	30 729	31	101	23 066	14	61
1970-4	29 060	12	41	19 980	9	45
Total	59 789	43	72	43 046	23	53

Welsh National School of Medicine, Cardiff CF4 4XN

HELEN WIGHTMAN, MB, MRCOG, formerly registrar, department of obstetrics and gynaecology

BRYAN M HIBBARD, MD, FRCOG, professor of obstetrics and gynaecology

MICHAEL ROSEN, MB, FFARCS, consultant anaesthetist

but there had been preceding pre-eclampsia and we felt that these were genuine cases of eclampsia occurring in susceptible patients. In the third case postpartum eclampsia followed delivery of a fetus that had died in utero five days before, but this patient had had a previous pregnancy complicated by eclampsia.

**Maternal age and gravidity**—The incidence of eclampsia was significantly higher ( $P < 0.001$ ) in primigravidae than multigravidae (table II). There was no significant trend either with increasing maternal age or between the two five-year periods.

**Time of onset**—In two-thirds of the cases the first fit occurred during or after labour, and over half occurred after 37 weeks' gestation (see tables III and IV).

TABLE II—Number of women with eclampsia according to age and gravidity (incidence/100 000 deliveries in parentheses)

Age (years):	<20	20-24	25-29	≥30	Total
Primigravidae	11 (181)	14 (155)	5 (117)	2 (123)	32 (136)
Multigravidae	2 (110)	1 (9)	5 (38)	3 (25)	11 (31)

TABLE III—Number of patients with eclampsia according to gestational age

Time of onset of eclampsia	Gestational age (weeks)						40
	28-29	30-31	32-33	34-35	36-37	38-39	
Antepartum	2	2	3	2	3	4	2
Intrapartum					3		10
Postpartum			2		3	2	5

TABLE IV—Fetal outcome in 43 single and multiple pregnancies in women with eclampsia of various times of onset. (Figures are numbers of infants)

Time of onset of eclampsia	Intrauterine growth retardation and preterm	Intrauterine growth retardation but term	Well grown but preterm	Well grown and term	Total
Antepartum { Survivors Deaths	1 6*	2 1	0 2	2 0	5 9 } 14
Intrapartum { Survivors Deaths	0 0	6† 0	0 0	12‡ 0	18 0 } 18
Postpartum { Survivors Deaths	1 1	4‡ 0	0 0	9† 0	14 1 } 15
Total { Survivors Deaths	2 7	12 1	0 2	23 0	37 10 } 47

\*Includes one death in second week due to respiratory distress syndrome and bronchopneumonia.  
†Includes one twin.  
‡All multiple births.

**Evidence of pre-eclampsia**—In 15 cases antenatal information was either incomplete or not available. In three the patients had not had antenatal care, in two the notes were not available, and in 10 there was only limited information. Of the patients in these 10 cases, however, seven had hypertension preceding eclampsia, one refused to go into hospital, and one was advised to rest at home. Full data were available on the remaining 28 patients, who had regular and complete antenatal care by usually accepted standards. Twenty had diastolic blood pressures exceeding 100 mm Hg recorded on at least one occasion before the onset of eclampsia, but in eight of these hypertension developed only during labour. Of the 12 patients whose hypertension was detected at the antenatal clinic, 11 were admitted for treatment before the onset of eclampsia. Proteinuria was detected antenatally and before the onset of eclampsia in only eight of the 43 patients, all of whom had hypertension. No patient had excessive weight gain (more than 2.25 kg in four weeks or 1 kg in one week).

**Previous and subsequent obstetric histories**—Eleven women had had 19 previous pregnancies proceeding beyond 28 weeks' gestation. Two of these had been complicated by eclampsia, but in neither mother was hypertension observed in the current pregnancy until labour had begun. Nineteen subsequent pregnancies were traced, none of which were complicated by eclampsia, although pre-eclampsia developed in 10 cases.

**Maternal mortality and morbidity**—No maternal deaths occurred during or after eclampsia, and there were no cases of anuria or

oliguria (less than 500 ml urine/24 h). Cardiac arrest occurred in one patient after a convulsion, but spontaneous cardiac activity was rapidly restored after a short period of external cardiac massage. Coagulation status was investigated in only three patients, two of whom had disseminated intravascular coagulopathy with clinical manifestations. In one case the disease was mild and spontaneous correction occurred after resuscitative measures. The other patient had severe multiple haemorrhages and was treated with heparin.

**Perinatal mortality and morbidity**—The 43 women delivered 47 babies, including two sets of twins and one set of triplets. There were five stillbirths, four early neonatal deaths, and one late neonatal death in the second week (this last, which was due to respiratory distress syndrome and bronchopneumonia, is included as a perinatal death in the tables, although it is not strictly so by definition). With one exception all the mothers whose infants died or were stillborn had their first fit before the onset of labour (table IV). The principal contributory factors to perinatal mortality were intrauterine growth retardation (birth weight below the 10th centile for gestational age) and preterm delivery (before 36 weeks' gestation). Overall, 22 babies (including five who were twins or triplets) had retarded growth; eight of these were lost, seven being preterm. All five stillbirths were due to anoxia before the onset of labour, and before admission in three cases; all were preterm, and four were also growth-retarded. The four early neonatal deaths were due to respiratory distress syndrome. Of these, two infants were growth-retarded and preterm, one was growth-retarded but mature, and one was preterm but had a weight above the 10th centile ("well grown"). One other growth-retarded, preterm infant had respiratory distress syndrome and died in the second week from bronchopneumonia. There were no perinatal deaths among the 23 mature, well-grown babies. Eight of the 37 surviving infants had complications. Two had minor congenital abnormalities (one hypospadias, one mild talipes); one mature infant was hypotonic and had cyanotic attacks but developed normally, while another had aspiration pneumonia and was possibly slow in developing. One infant, whose mother had been given 100 mg of diazepam before delivery, needed two exchange transfusions because of neonatal drug depression; one preterm, growth-retarded infant suffered from hypoglycaemia. Two growth-retarded infants, one of whom was also preterm, had respiratory distress syndrome—of the seven babies overall who had respiratory distress syndrome, these were the only two who survived.

**Management**—The drugs prescribed fell into seven pharmacological groups: sedatives (43 cases; 100%), systemic analgesics (32; 74%), epidural analgesia (4; 9%), hypotensives (5; 12%), diuretics (10; 23%), steroids (2; 5%), and antibiotics (25; 58%). Twenty-five different permutations of drugs from these groups were used in treating the 43 patients. Many patients had more than one drug from each group, the choice being largely dependent on the preference of the individual consultant and whether emergency treatment at home was given. Although analgesics were given to three-quarters of the patients, their administration was not necessarily related to pain or whether the patient was in labour. The greatest variations occurred in the use of anticonvulsants and sedatives; table V shows the principal drugs used in the two five-year periods. In 1965-9, 60% of the patients were given three or more different sedatives and only 7% were given one; in 1970-4, 27% were given three or more and 36.5% only one. During this second period diazepam and phenothiazines tended to replace the barbiturates, bromethol, and paraldehyde prescribed during the first. Five of the patients who delivered live infants were given 45-100 mg of diazepam, although 30 mg is now recognised as being the maximum safe maternal dose if fetal effects are to be avoided.<sup>4</sup>

TABLE V—Number (%) of patients receiving sedatives and anticonvulsants during 1965-9 and 1970-4

	Barbiturates	Bromethol	Diazepam	Paraldehyde	Phenothiazines
1965-9 (n = 31)	29 (94)	18 (58)	8 (26)	14 (45)	9 (29)
1970-4 (n = 12)	3 (25)	1 (8)	8 (67)	1 (8)	6 (50)

## Discussion

Eclampsia is now rare in Britain. The incidence of 72/100 000 deliveries in the specialist units in Cardiff is similar to that found in comparable units elsewhere in the UK. This figure was inflated, however, by the admission of high-risk cases from outside the area, and the incidence for Cardiff residents was

only 53/100 000 deliveries. We estimate, therefore, that on average a consultant obstetrician may expect to treat only one case every two years and junior staff are likely to see at most five cases during their training.

Despite its rarity, however, eclampsia accounts for one in 12 of all maternal deaths, excluding those cases in which it is only a contributory factor—for example, when preceding pulmonary embolism. Yet there are several reports of series of patients with eclampsia treated without maternal mortality, notably that of Pritchard and Pritchard,<sup>5</sup> in which all 154 patients survived. Twenty-nine maternal deaths were attributed to eclampsia in England and Wales in 1970-2,<sup>1</sup> an incidence of 12.5 deaths/million women delivered. If the Cardiff incidence of eclampsia of 53 cases/100 000 deliveries applied to all England and Wales maternal deaths from eclampsia, largely avoidable, would reach about 2.4%.

In the present series the perinatal mortality in the cases of eclampsia (213/1000) was nine times higher than that for all deliveries during the same period (24/1000). When the figures were corrected for gestational age and birth weight, however, there was little difference. The perinatal problems were mainly related to preterm delivery and intrauterine growth retardation (table IV), all the stillbirths being due to intrauterine asphyxia and the neonatal deaths to respiratory distress syndrome. Only one fetus died before eclampsia occurred. The greatest risk for the fetus is when eclamptic fits, with their attendant periods of acute maternal (and therefore fetal) anoxia, occur before delivery and the fetus is already compromised by placental insufficiency. Seven of the 10 perinatal deaths were in this category.

We considered that six of the babies who died might have been saved by current standards of practice. They included two stillborn infants, whose intrauterine death occurred in hospital and who might have been saved by caesarean section; and four of the five babies with respiratory distress syndrome, who might have been saved by improved neonatal care. The fifth baby with respiratory distress syndrome weighed only 700 g.

The earlier detection of intrauterine growth retardation, which was present in 22 cases, though recognised in many only retrospectively, might have led to the more timely termination of pregnancy, with reduced risk of eclampsia and improved prognosis, in eight of the 10 mothers whose infants died. In only six of the 17 singleton pregnancies with intrauterine growth retardation, however, were there alerting features of danger—namely, prolonged pre-eclampsia (four patients), clinical recognition of growth retardation (two, including one with pre-eclampsia), and antepartum haemorrhage (one). Detecting pre-eclampsia and implementing treatment earlier might also have been more effective. No hypertension (diastolic pressure exceeding 100 mm Hg) was detected antenatally in 24 cases, but in this group six babies were lost. In eight of these cases antenatal care was absent or inadequate and the fault was wholly or partly with the patient. Of the women known to have raised diastolic blood pressure before the onset of labour, 16 were treated in hospital. Despite this, three of their 19 babies were lost.

The extent to which the differing modes of treatment influenced perinatal outcome is not clear, but polypharmacy is more likely to lead to errors, with consequent maternal and fetal complications. Treatment should be simple, avoiding large doses of drugs such as diazepam, which adversely affect the baby.<sup>3</sup> Simple drug regimens with which the clinician is already familiar are preferable.<sup>6</sup>

How can perinatal mortality associated with eclampsia be reduced? The outstanding antenatal feature relating to fetal loss is placental insufficiency associated with intrauterine growth retardation and asphyxia, the asphyxia being further aggravated by eclamptic fits. Postnatally the respiratory distress syndrome is the dominant problem, but antenatal events are contributing factors. Failing placental function in patients with pre-eclampsia may be detected by more-intensive antenatal monitoring of fetal growth by ultrasound and of fetal condition by daily counts of fetal movements and cardiotocography. This can be achieved

only with good compliance by the patient, a factor notably lacking in many of the cases recorded. Better facilities for domiciliary visiting of non-attenders are indicated. Because of the perinatal problems resulting from anoxia more-liberal recourse to caesarean section should be considered, especially when there is evidence of impaired placental function and preterm delivery is required. The hazards of respiratory distress syndrome in the preterm, growth-retarded baby are minimised by delivering the baby in good condition and restricting administration to the mother of drugs that "carry over" and might depress respiration and have other adverse effects such as impairment of thermoregulation. Prompt resuscitation and the availability of neonatal intensive care facilities are essential.

We believe that successful results in cases of eclampsia depend as much on standards of staffing and care as on specific regimens. All patients who develop eclampsia should be delivered in a fully equipped unit with an integrated team of obstetricians, anaesthetists, and paediatricians. As eclampsia is rare and yet life-threatening to both mother and fetus its management—as that of cardiac arrest—should be carefully planned and regularly rehearsed.

We are indebted to Miss Joan Andrews and the staff of the Cardiff Births Survey for providing the epidemiological data, and to our consultant colleagues for permission to review the case records of patients under their care.

## References

- <sup>1</sup> DHSS, *Report on Confidential Enquiries into Maternal Deaths in England and Wales 1970-72*. London, HMSO, 1974.
- <sup>2</sup> Ministry of Health, *Report on Confidential Enquiries into Maternal Deaths in England and Wales 1961-63*. London, HMSO, 1966.
- <sup>3</sup> Campbell, W S, *Ulster Medical Journal*, 1949, **18**, 212.
- <sup>4</sup> Cree, J E, Meyer, J, and Haley, D M, *British Medical Journal*, 1973, **4**, 251.
- <sup>5</sup> Pritchard, J A, and Pritchard, S A, *American Journal of Obstetrics and Gynaecology*, 1973, **123**, 543.
- <sup>6</sup> Hibbard, B M, and Rosen, M, *British Journal of Anaesthesia*, 1977, **49**, 3.

(Accepted 5 May 1978)

---

ONE HUNDRED YEARS AGO The annual *conversazione* at the Royal College of Physicians affords a very pleasant *réunion* of members of the profession, and that of Wednesday last proved by no means below the average in interest and attraction. The scientific instruments exhibited were of more than usual interest. Dr Burdon Sanderson exhibited and personally demonstrated many physiological apparatus. In particular, a rhiotome and compensator in conjunction with Lippmann's electrometer, as adapted for research in animal and vegetable electricity, attracted much attention; by this arrangement, minute electrical currents can be estimated with great accuracy. Dr Pritchard demonstrated some of his beautiful preparations showing the minute anatomy of the cochlea and vestibule of the internal ear. Professor Hughes's microphone, in conjunction with the bi-aural telephone, enabled visitors to hear the ticking of a watch at a distance of several yards; this and the phonograph, as exhibited by the Stereoscopic Company, attracted much attention throughout the evening. Mr Hawksley's surface thermometer, especially that made after Dupré, with a registering index, appeared as convenient and useful a form of the instrument as any that have yet appeared. A thermograph was seen at work, recording the movements of the mercurial column of a thermometer upon a smoked cylinder, which was adjusted to revolve once in an hour. Other instruments of much interest were also exhibited. Several water-colour drawings and oil-paintings were lent for the occasion, but the art exhibits were not so numerous as on former occasions. Among the visitors present were Cardinal Manning; the Right Honourable Robert Lowe, MP; Dr Cameron, MP; Mr Samuel Morley, MP; Dr Eason Wilkinson, President of the British Medical Association; Dr Wade of Birmingham; Dr Yandell of the United States of America; and all the members of the General Medical Council. The President of the College, Dr Risdon Bennett, received his numerous visitors throughout the evening with untiring courtesy, and the *conversazione* was one in every way worthy of the College. (*British Medical Journal*, 1878.)