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INTRAPARTUM-RELATED BIRTH ASPHYXIA IN SOUTH AFRICA — LESSONS FROM THE FIRST NATIONAL PERINATAL CARE SURVEY

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Background. The recent amalgamation of data by users of the Perinatal Problem Identification Programme (PPIP) throughout South Africa has culminated in the publication of the Saving Babies report.

Objectives. To determine the absolute rate of death from intrapartum-related birth asphyxia, and the contribution of intrapartum-related asphyxia to total perinatal mortality in South African hospitals, and to identify the primary obstetric causes and avoidable factors for these deaths.

Methods. The amalgamated PPIP data for the year 2000 were obtained from 27 state hospitals (6 metropolitan, 12 town and 9 rural) in South Africa. In PPIP-based audit, all perinatal deaths are assigned primary obstetric causes and avoidable factors, and these elements were obtained for all deaths resulting from intrapartum-related birth asphyxia.

Results. There were 123 508 births in the hospitals surveyed, with 4 142 perinatal deaths among infants ≥ 1 000 g, giving a perinatal mortality rate of 33.5/1 000 births. The perinatal mortality rate from intrapartum-related birth asphyxia was 4.8/1 000 births. The most frequent avoidable factors were delay by mothers in seeking attention during labour (36.6%), signs of fetal distress interpreted incorrectly (24.9%), inadequate fetal monitoring (18.0%) and no response to poor progress in labour (7.0%). The perinatal mortality rates for metropolitan, town and rural areas were 30.0, 39.4 and 30.9/1 000 births respectively. The contribution of intrapartum-related birth asphyxia to perinatal mortality in these areas was 10.8%, 16.7% and 26.4% respectively.

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Conclusion. The high rates of perinatal death from intrapartum-related birth asphyxia in South Africa are typical of those in underdeveloped countries, with the most serious deficiencies in rural areas. Most of these deaths are avoidable and the reduction of these rates presents an important challenge to providers of perinatal care in this country. Areas worthy of research and action include provision of mothers' waiting facilities in rural regions, improvements in fetal monitoring, partogram-based labour management, and the establishment of midwifery staffing norms for South African labour units.

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The death of an infant as a result of intrapartum-related birth asphyxia ('birth asphyxia') is always tragic and frequently avoidable. In well-functioning health services these deaths should be a rarity, as the causes and prevention of birth asphyxia are well understood. Perinatal audit using the Perinatal Problem Identification Programme (PPIP) has, however, identified birth asphyxia as a common and important cause of perinatal death in certain areas of South Africa.^{1,2} More widespread use of PPIP in a large number of institutions in this country has now allowed amalgamation of data so that a more representative picture of perinatal mortality can be obtained. Twenty-seven hospitals, from metropolitan, town, and rural areas collaborated in the year 2000 towards the publication of the Saving Babies report, giving the results of the first national perinatal care survey in South Africa.³ The 27 hospitals were drawn from all provinces except Limpopo, and from all major metropolitan centres, with the exception of Port Elizabeth and Bloemfontein. This sample, as a collaboration of PPIP users, was self-selected and is not necessarily representative of all South African hospitals, nor does it include any deliveries in homes, clinics or midwife obstetric units.

Using the data from this collaboration, this article will describe the contribution of birth asphyxia to total perinatal mortality, with comparison between metropolitan, town and rural areas, and emphasis on primary obstetric causes of death, and avoidable factors.

METHODS

By the year 2000, 27 state hospitals in South Africa were using PPIP methodology to audit perinatal deaths. These institutions were asked to submit their data from 1 January 2000 to 31 October 2000, to provide material for discussion at a perinatal care workshop in Hammanskraal, North West, from 12 to 14 November 2000. The workshop was attended by PPIP users and representatives of South African provincial and national health departments. A detailed summary of the workshop's proceedings and outcomes may be read in the Saving Babies report.³

The hospitals and health regions that submitted perinatal data are as follows. From metropolitan areas: Peninsula Maternity and Neonatal Services (Groote Schuur, Peninsula Maternity and Somerset hospitals and their midwife obstetric units), Kalafong, Chris Hani Baragwanath, and King Edward VIII hospitals; from towns: Witbank, Rob Ferreira, Frontier, Mafikeng, Middelburg (Mpumalanga), Potchefstroom, Empangeni, Settlers, Eben Dönges, Kimberley, Goldfields and Klerksdorp hospitals; and from rural areas: Gelukspan, Lydenburg, Shongwe, Standerton, Port Alfred hospitals and Jozini Health District (Bethesda, Manguzi, Mosvold and Mseleni hospitals and their residential clinics).

The PPIP methodology involves identification of all perinatal deaths, with the assignment of a primary obstetric cause of death to each case, and avoidable factors if present.^{1,2} Avoidable factors are systematically divided into patient-related, administrative-related and health worker-related problems. The PPIP software includes menus of causes of death and avoidable factors to ensure consistency in reporting. For analysis of mortality from birth asphyxia we included all deaths that had been classified as caused by labour-related asphyxia, cord around the neck, cord prolapse, meconium aspiration, difficult breech delivery, difficult vacuum or forceps delivery, and ruptured uterus. In all these cases the fetuses were alive at the onset of labour. The presence and nature of avoidable factors were noted. The data are presented using descriptive statistics and, where necessary, analysis of frequency differences by means of the chi-squared test. A *P*-value of less than 0.05 was accepted as statistically significant.

RESULTS

Not all institutions were able to provide complete data sets for January - October 2000, as a number of them had only begun using PPIP during the year. A total of 4 142 perinatal deaths of infants with birth weight of 1 000 g or more were reported from 123 508 births at the PPIP users' sites. There were 58 230 births at metropolitan institutions, 45 327 at town hospitals, and 19 951 in the rural regions, with 1 741, 1 785 and 616 perinatal deaths respectively. The perinatal mortality rates for the metropolitan, town, and rural groupings were 29.9, 39.3 and 30.9/1 000 births, respectively.

Table I shows the absolute perinatal mortality rate due to birth asphyxia, and the contribution of birth asphyxia to perinatal mortality, for metropolitan, town and rural areas. Data from Kimberley, Goldfields and Standerton hospitals were excluded because of incomplete information on causes of perinatal death, leaving 115 160 births (58 230 metropolitan, 38 686 town and 18 244 rural) for analysis. The respective absolute perinatal mortality rates were 3.2, 5.8 and 7.7 per 1 000 births respectively (chi-squared test, *P* < 0.0001). The contribution of birth asphyxia to total perinatal mortality was highest in rural areas (26.4%), followed by town (16.7%) and metropolitan areas (10.8%).



Table I. Absolute perinatal mortality rate due to intrapartum-related birth asphyxia, and the contribution of intrapartum-related birth asphyxia to total perinatal mortality for metropolitan, town and rural areas (N = 550)

	Number of births	Number of perinatal deaths	Perinatal deaths from birth asphyxia	Perinatal mortality rate for birth asphyxia per 1 000 births*	Birth asphyxia as a percentage of all perinatal deaths
Metropolitan	58 230	1 741	187	3.2	10.8
Town and city†	38 686	1 335	223	5.8	16.7
Rural‡	18 544	531	140	7.7	26.4

* Chi-squared test, $P < 0.0001$.
 † Excludes Kimberley and Goldfields hospitals.
 ‡ Excludes Standerton hospital.

The primary obstetric causes of birth asphyxia-related deaths are shown in Table II. The method of amalgamation of data at the workshop does not allow division of these causes into metropolitan, town and rural groups. The primary causes of death, and avoidable factors, were not available for some of the hospitals, leaving a denominator of 401 (73% of all deaths resulting from birth asphyxia). The most frequent causes of death from birth asphyxia were labour-related asphyxia (65.8%), cord prolapse (11.2%), cord around the neck (7.2%), meconium aspiration (7.0%) and difficult breech delivery (4.7%).

Table II. Primary obstetric causes of deaths resulting from intrapartum-related birth asphyxia (N = 401)

	Number (%)
Labour-related asphyxia	293 (73.1)
Cord prolapse	45 (11.2)
Meconium aspiration	28 (7.0)
Birth trauma — breech or assisted delivery	27 (6.7)
Ruptured uterus	8 (2.0)

Table III shows avoidable factors for the 401 deaths from birth asphyxia. The most frequent avoidable factors were delay by mothers in seeking attention during labour (36.6%), signs of fetal distress interpreted incorrectly (24.9%), inadequate fetal monitoring (18.0%) and no response to poor progress in labour (7.0%).

DISCUSSION

Comparative death rates

The amalgamated data for this selection of South African hospitals are the most representative yet on the true situation regarding perinatal mortality in this country. We now have an estimate of the perinatal mortality rate in different areas of

Table III. Avoidable factors for deaths caused by intrapartum-related birth asphyxia (N = 401)

	Number (%)
Delay in seeking medical attention during labour	150 (36.6)
Signs of fetal distress interpreted incorrectly	100 (24.9)
Inadequate fetal monitoring	72 (18.0)
Inappropriate response to poor progress in first stage of labour	42 (10.5)
Inappropriate response to poor progress in second stage of labour	35 (8.7)

South Africa, and have shown that death from birth asphyxia is highly prevalent, especially in rural institutions. The sample of hospitals was self-selected, with all hospitals staffed by enthusiastic users of PPIP with an interest in perinatal audit. It is possible that these institutions may therefore provide better than average care, and that the true national figure of perinatal mortality, and the contribution of birth asphyxia, may be higher than stated in these results. International comparison confirms that our absolute rate of death from birth asphyxia is similar to that of other developing countries. Our town rate of 5.8 per 1 000 births is similar to the 6.8 per 1 000 for Bulawayo in Zimbabwe in 1992.⁴ Our rural rate of 7.7 per 1 000 is somewhat lower than the 14.0 per 1 000 from Eldoret, Kenya, in 1992,⁵ and 10.8 per 1 000 from Kathmandu, Nepal, in 1995.⁶ Yet, our metropolitan rate of 3.2 per 1 000 is still far higher than the 0.89 per 1 000 in the UK (excluding Scotland).⁷ Clearly, too many South African babies are dying as a result of intrapartum events. The high rate of birth asphyxia in rural areas is perhaps not surprising. The reasons for this high rate are not clear from available data, but possible explanations include shortage of midwives and doctors, absence of specialist advanced midwives or obstetricians, lack of equipment for labour monitoring and neonatal resuscitation, transport problems for



women in labour, and the use of herbal medicines by pregnant women. Town hospitals did not fare much better, and continued monitoring of their situation remains a necessity.

Delayed attendance by women in labour

The reported avoidable factors provide important insights into weaknesses in perinatal care. The most frequent reason, late attendance by women in labour, begs the question whether the delays are wilful or related to problems with access to hospitals and clinics. It is well known that ambulances are in short supply in South Africa and this lack is especially severe at night and in rural areas. The improvement of the transport infrastructure is a problem that goes beyond provision of health services, but must be stated as a goal to help improve perinatal care. In some rural areas, hospitals provide 'waiting areas' for mothers, with pregnant women boarding in or next to the hospital grounds from 38 weeks' gestation.⁸ Food and bedding may or may not be provided, but the women have the advantage of being at the hospital when labour pains start. Properly managed, these waiting areas provide a simple means of ensuring a supervised delivery. Mothers' waiting areas should be offered at all rural hospitals and clinics.

Furthermore, antenatal care must provide pregnant women with a delivery plan and open discussion on how they will get to hospital when labour pains start. Too often, these steps are neglected, and many women have no idea when, where or how they will give birth.

Fetal monitoring

One hundred deaths resulted from failure to interpret fetal distress correctly. How this assessment was made is not known from the data. In a further 72 cases, death followed failure to monitor the babies during labour. Fetal monitoring is problematic because of the difficulty of making a decision about fetal well-being using only the heart rate as a marker. Meconium staining of the liquor may be of help, but its absence does not exclude fetal distress and its presence is not specific. Fetal scalp blood sampling has not, to our knowledge, been a success in any large state-run South African hospital, and is usually used in conjunction with cardiotocography (CTG). The fetal heart rate can be recorded by using a stethoscope (Pinhard or other), hand-held Doppler instrument, or a CTG recorder. The cost of CTG monitoring is so prohibitive that it cannot be considered as a routine method of fetal monitoring in this country. Hand-held Doppler monitoring has shown promise as a more effective method of fetal surveillance than a stethoscope and should be considered for use in all labour units.⁹ It is probably true to say that most babies who die from birth asphyxia are the product of otherwise low-risk pregnancies. Therefore it is difficult to identify which fetuses are at risk until a risk factor becomes apparent, sometimes only late in labour. Another serious barrier to fetal monitoring is the shortage of midwives in South African public institutions.¹⁰ Too frequently, it is impossible for an understaffed labour unit to provide any fetal monitoring during labour. The establishment of midwifery staffing norms

for South African hospitals and midwife obstetric units is long overdue. Once a national standard for staffing levels has been set, it will be possible to identify labour units that require additional midwives. Research is needed to determine the exact nature of the problem with fetal monitoring as it relates to birth asphyxial death in South Africa. The current recommendation, that the fetal heart should be auscultated half-hourly before, during and after contractions, should still be followed.¹¹

Labour management

Some 10% of deaths from birth asphyxia were related to the failure to manage poor progress in labour, or to use a partogram. Originally introduced in Africa, the partogram has become the worldwide standard for labour monitoring, and was evaluated by the World Health Organisation in South-East Asia where a reduction in intrapartum fetal deaths was associated with partogram use.¹² Labour progress that crosses the action line has been shown to be associated with poor fetal outcome.¹³ The partogram must be promoted as the only legitimate record of labour progress, to the extent that failure to use a partogram would be seen as negligent or indefensible in a medicolegal context. Training of student midwives and medical students, and re-training of midwives and doctors, must emphasise the central position of the partogram in labour management. Every hospital and midwifery clinic in South Africa should have a clear partogram-based labour management protocol, preferably with a display in the labour ward. There is a place for research into barriers to partogram use.

The second stage of labour

A prolonged second stage of labour is associated with an increased risk of fetal hypoxia, and subsequent damage or death. At primary care level, clear protocols must be available and displayed so that correct action is taken. The chapter on the second stage of labour in the Perinatal Education Programme provides excellent guidelines on the management of the second stage by midwives.¹⁴ At referral level, there should be personnel with skill in the assessment of a patient with prolonged second stage of labour, to decide on the most suitable mode of delivery. If assisted delivery is chosen, experience and competence with the vacuum extractor, combined with adherence to the rules of vacuum delivery, will ensure that perinatal disasters are prevented. Second-stage complications with breech delivery accounted for a small number of deaths. Vaginal breech delivery is now known to be associated with a poor fetal outcome when compared with planned caesarean delivery, and elective caesarean section should be the delivery method of choice for breech presentation at term.¹⁵

Audit meetings

Perinatal audit meetings, also known as morbidity and mortality meetings, provide an opportunity for all staff who work in an obstetric unit to learn about pitfalls in labour care and how these lead to intrapartum-related deaths. Audit



meetings also provide motivation for regular data collection, opportunities for staff to meet, and for other health problems to be discussed by the group. The implementation of perinatal audit has been shown to be associated with a reduction in the perinatal mortality rate, especially from labour-related asphyxia.¹ Provinces should place priority on instituting audit meetings at all delivery units. In our experience, South African midwives are resistant to involvement in perinatal audit, and research is required to identify barriers to the establishment of perinatal audit meetings in midwifery settings.

CONCLUSION

Perinatal death from asphyxia and trauma is tragic and preventable. The data in this report will provide useful information for health planners and politicians involved in health care provision. The Medical Research Council (MRC) Unit for Maternal and Infant Health Care Strategies will now supervise the implementation of detailed confidential enquiries of all deaths caused by intrapartum-related birth asphyxia at hospitals that perform PPIP-based perinatal audit. This supervision will give more precise information on the weaknesses in perinatal services in South Africa, so that specific recommendations for improvement can be made.

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RANDOMISED TRIALS IN THE SOUTH AFRICAN MEDICAL JOURNAL, 1948 - 1997

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Objective. To describe randomised controlled trials (RCTs) published in the *South African Medical Journal (SAMJ)* over a 50-year period from 1948 to 1997 with regard to number, topic and quality.

Methods. We hand searched all issues of the *SAMJ* published during the study period to identify all published RCTs.

Outcome measures. Number, topic and quality of RCTs published from 1948 to 1997.

Results. Eight hundred and fifty-eight clinical trials were published during the period reviewed. Eighty-four per cent of RCTs were published as full articles. During the 1980s the number of RCTs published increased rapidly, with a peak of 35 in 1985, but then declined to only 5 in 1997. The majority (92%) of RCTs were conducted in a hospital setting. A varied range of subjects was covered, with gastroenterology taking the lead and no trials in public health. The sample size in more than 50% of RCTs was smaller than 50 patients. Fifty-one per cent (435 trials) used random allocation and 49% (423) quasi-random methods of allocation.

Concealment of treatment allocation was judged to be adequate in 46% of studies ($N = 200$), blinding of observers assessing outcomes was adequate in 28% (123), and all the allocated test subjects were included in the primary analysis in 28% (123). The follow-up period was more than 1 year in 4% (17) and less than 6 days in 16% (71).

Conclusions. Compared with other international journals the *SAMJ* is highly regarded in terms of the number of trials published. There are, however, a number of deficiencies in the quality of the trials.

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