Meconium aspiration in South Africa

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This retrospective study of 569 cases of meconium aspiration from 11 institutions in South Africa reveals a high incidence varying from 4 to 11/1 000 and a mortality rate of 12%. Mortality was significantly related to the degree of asphyxia at birth. Twenty-five per cent of the babies (136/569) required intensive care and 36% died. Of the mothers 18 - 25% were unbooked and most of the babies were inborn (87%). Babies born to primiparous mothers and to mothers over 35 years of age were at greater risk of death. In order to reduce mortality and the numbers admitted to the intensive care unit simple measures for the reduction in the incidence of this disease need to be emphasised in all teaching and training programmes.

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Meconium aspiration and birth asphyxia are the major causes of morbidity and mortality in term neonates in South Africa. At King Edward VIII Hospital in 1980 there were 360 cases of meconium aspiration; of these babies 34 (9,4%) died, and meconium aspiration was responsible for 6,6% of deaths of term babies.[1] In 1982 Baragwanath Hospital had 184 cases, of whom 14 died, and in that year this condition caused 4,7% of term deaths.[2] These complications occur mainly in black babies, reflecting the lack of primary health care facilities experienced in this community. The purpose of this study was to examine in as much detail as possible the question of meconium aspiration from as many centres as was feasible.

Patients and methods

A questionnaire was posted to 14 hospitals requesting information on cases of meconium aspiration for any 1-year period. Meconium aspiration was defined as meconium exposure with respiratory distress and the presence of typical radiological changes. The following details were sought: maternal age, parity, booking status, complications during pregnancy, birth weight, gestational age, weight centile, sex, inborn/outborn, mode of delivery, Apgar scores

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at 1 and 5 minutes, prolonged resuscitation, neonatal complications, duration of hospital stay, and death or survival. For those babies admitted to intensive care units (ICUs) additional information on duration of oxygen therapy, peak inspiratory pressures, complications during ventilation and duration of intensive care was requested.

Statistical methods

Descriptive statistics consisted of frequencies and percentages, or means and standard deviations where appropriate. The chi-square test was used on categorical data to test for significance of associations while the *t*-test was used for continuous data.

Results

Eleven of the hospitals provided information, 8 gave almost all the information requested, 1 institution could capture data for only 3 months, and another could not provide the detail requested. Where appropriate the data were included in the analyses. The totals reflected in the different sections of the results therefore vary accordingly.

One of the difficulties in the data collection was that some institutions did not clearly separate the severely asphyxiated infants with meconium aspiration from those with lesser degrees of asphyxia. Ventilatory support for severely asphyxiated infants is not provided at all institutions because of limited facilities.

General

A total of 569 cases were studied, of which 479 had most of the details requested. The racial distribution was: black 492, white 52, Indian 13, coloured 11. One hundred and thirty-six (24%) babies were admitted to ICUs. Baragwanath ventilated 50 babies, Tygerberg 20, King Edward 16, Johannesburg 16, Ga-Rankuwa 11, Cecilia Makiwane 13, and Pelonomi 10. Analyses could be performed on 135 of these ICU patients.

Maternal details

Age and parity. Of the 468 mothers 37 (8%) were < 18, 368 (78%) 18 - 35, and 63 (14%) > 35 years of age. The parity was 0 in 88 (19%), 1 - 4 in 357 (76%), and > 4 in 23 (5%). Babies of 23 (37%) of 63 mothers over 35 years of age were admitted to an ICU; 10 of these 23 (43%) died compared with 25 deaths of 112 babies (23%) of mothers aged < 35 years (P = 0,037, RR 1,93). ICU mortality of babies born to primiparous mothers was 53% (20/38) compared with mothers of parity > 1 where mortality was 15% (15/97) (P < 0,001, RR 3,4).

Booking status. One hundred and thirty-two (25%) of the 534 mothers were unbooked. The average percentage of unbooked patients at the different institutions was 18% but at one institution it was 66%.

Complications during labour and delivery. Complications during labour and delivery occurred in 329 (72%) and included meconium-stained liquor in 209 (65%), pregnancy-induced hypertension in 60 (28%), and abruptio placentae, fetal distress, intra-uterine infection, prolonged rupture of membranes, cephalopelvic disproportion and cord prolapse (4% each).

Neonatal details

Incidence. The incidence of meconium aspiration was as follows: Ga-Rankuwa 11/1 000, King Edward 9/1 000; Tygerberg 6/1 000, Johannesburg 6/1 000, Baragwanath 5/1 000, and Groote Schuur 4/1 000.

Birth weight. Of 459 babies 397 (84%) weighed 2,5 - 3,99 kg, 19 (4%) > 4,0 kg, 48 (10%) 2,0 - 2,49 kg and 10 (2%) < 2,0 kg.

Gestational age and weight centile. This was not well documented, and the number of babies who were appropriately grown, light for dates, 'wasted' or post-term could not be ascertained.

Inborn or outborn. Fifty-nine (13%) of the 467 neonates were outborn.

Mode of delivery. Two hundred and twenty-one (47%) were delivered vaginally, 230 (49%) were delivered by caesarean section and 16 (4%) were breech, vacuum or forceps deliveries.

Mortality (Table I). Seventy of 569 babies died, an overall mortality rate of 12%. Of the 136 babies receiving intensive care, 48 died, a mortality rate of 36%. Four per cent (16 of 434) of non-ICU admissions died. Neurological involvement contributed to death in the majority of these infants.

Table I. Factors contributing to mortality

Variable	No.	Deaths	*P*-value
Inborn	393	53 (13%)	NS
Outborn	59	9 (15%)	
Booked	362	49 (14%)	NS
Unbooked	80	15 (18%)	
Race			
Black	482	59 (12%)	NS
White	52	4 (7%)	
Indian	13	1 (7%)	
Coloured	11	0	
Delivery			
NVD	221	34 (15%)	NS
Caesarean	230	28 (12%)	
Other	16	3 (0,6%)	
Sex			
Male	228	34 (13%)	NS
Female	170	25 (12%)	
Birth weight			
2,5 - 3,99	397	57 (15%)	NS
< 2,5	47	6 (13%)	
Apgar 1 min			
< 5	212	40 (19%)	0,006
> 5	238	23 (10%)	
Apgar 5 min			
< 5	73	25 (34%)	< 0,0001
> 5	372	37 (10%)	
Prol. resus.			
Yes	125	34 (28%)	< 0,0001
No	274	18 (6%)	

Prol. resus. = prolonged resuscitation.

The following factors did not contribute significantly to the mortality: place of birth (inborn or outborn), mode of delivery, race, booking status, sex and birth weight. The only associations with death were the Apgar scores at 1 and 5 minutes and the need for prolonged resuscitation. However, these variables were not of significance in the ICU admissions.

With regard to the ICU management the need for paralysis and inotropic support did not influence mortality. Patients suffering complications such as pneumothorax, persistent pulmonary hypertension, renal involvement, gastro-intestinal disturbance and chronic chest disease did not have a higher mortality rate than those who did not have these conditions. However, those 64 (51%) babies suffering hypoxic ischaemic encephalopathy (HIE) in the ICU had a marginally higher mortality rate (P = 0,065). This may be due to the selection of patients admitted to the ICU. Adequate information on oxygen therapy could not be obtained from the data.

The overall mortality rate at Baragwanath was 23%, King Edward 9% and Ga-Rankuwa 10%. The ICU mortality rate at these hospitals was 44%, 44% and 73% respectively.

Hospital stay. The mean durations of hospital and ICU stay are shown in Table II.

Table II. Hospital stay

Variable	Hours (mean ± SD)	P value
Hospital stay		
ICU	231,0 ± 198,2	< 0,0001
Non-ICU	156,34 ± 124,7	
ICU stay		
Survivors	325,5 ± 203	< 0,0001
Non-survivors	86,5 ± 135	

Neonatal complications. In non-ventilated patients (479 babies) the commonest complication was HIE in 139 (29%), metabolic acidosis in 25 (5%), septicaemia in 15 (3%), and congestive cardiac failure in 6 (1%). In ventilated patients (125) the commonest complication was also HIE in 64 (51%), persistent pulmonary hypertension in 40 (32%), sepsis in 27 (22%), gastro-intestinal disturbance in 27 (22%), pneumothorax in 23 (18%), renal involvement in 21 (17%), and chronic lung disease in 5 (4%). In those patients who developed a pneumothorax the mean peak inspiratory pressure was significantly higher, 35,4 cm H_2O (SD 8,40) v. 28,7 (SD 7,85) in those who did not suffer this complication (P = 0,0007).

Discussion

The incidence of meconium aspiration is quoted as 1 - 3% and it is stated that most babies with meconium aspiration who are not ventilated will recover within a week. Those who do need respiratory support may require many days of ventilator therapy but death is rare.[3] Gotoff[4] states that mortality is higher in babies with meconium staining of the liquor than in babies with unstained liquor. The results of this study, although retrospective, emphasise the need for intervention which will significantly reduce the number of babies who suffer this condition and reduce the cost of care. The incidence varied from 4 to 11/1 000. The highest mortality rate was 12%. The unbooked cases comprised 25% of the sample but at one institution 66% of the mothers were unbooked. It is very likely that the latter reflects the number of unbooked mothers that may exist in areas not represented in this sample. The mortality rate among the babies born outside and to unbooked mothers is no different from that of the babies born in institutions and to booked mothers. Babies born to primiparous mothers and those over 35 years of age were at greater risk of death. Fetal distress was recorded in only 4% of cases and meconium staining of the liquor in 68%.

The interpretation of these results suggests that the care of the mother during labour and the infant at the time of delivery requires scrutiny. Meconium aspiration can be managed effectively by the joint effort of the obstetrician and the paediatrician caring for the affected neonate[5] within an institution. The significance of meconium-stained liquor has to be impressed on all those in attendance in delivery suites. Although about 10% of babies exposed will aspirate meconium,[6] meconium-stained liquor is a warning sign that has to be taken seriously if the number of babies suffering this preventable condition, and hence the high cost of ventilation and time spent in the ICU, are to be reduced. Further, with declining resources and the pressure on intensive care beds it is mandatory to reduce the incidence of this disease and prevent admission to ICUs. In all teaching programmes it is essential to stress the significance of meconium-stained liquor, the early referral of mothers in labour with fetal distress, the importance of intra-uterine resuscitation once fetal distress has been diagnosed, and expeditious delivery. The careful suctioning of the nasopharynx prior to the delivery of the thorax coupled with tracheal suction under direct vision after delivery if meconium is still present in the hypopharynx and the performance of a stomach wash-out following the resuscitation procedure must be emphasised. According to Benny *et al.*[7] and Wiswell and Henly[8] this management will significantly reduce the incidence of meconium aspiration syndrome and prevent the severe cases that require ICU care. There will, however, still be a percentage of babies who will have aspirated *in utero* and for whom the above procedures will not entirely prevent respiratory distress. In favour of this argument is the 49% of babies in our study who were delivered by caesarean section compared with 47% by the vaginal route. Either the caesarean section was performed too late or intra-uterine aspiration would have occurred despite obstetric intervention. A recent review concluded that meconium aspiration is solely the result of intra-uterine asphyxia and obstetric and paediatric intervention does not influence the occurrence of this condition.[9]

A prospective study is being considered in which it is hoped that more clearly defined areas of intervention will be elucidated and appropriate strategies defined in an attempt to reduce the incidence of this condition.

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