Neonatal outcome of meconium associated deliveries in Madina Munawara region of Saudi Arabia

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ABSTRACT
Meconium Aspiration Syndrome in neonates is one of the major problems that has not been fully solved. Although the overall incidence has decreased significantly over the past two decades, the mortality among those ventilated is still high. Objectives: The present study was aimed at finding out the magnitude and outcome of this problem in our hospital. There have been no previous studies from the Kingdom of Saudi Arabia. Methods: A retrospective study was carried over a period of 18 months in Madina Maternity and Children's Hospital, KSA. Case notes of all the babies admitted with a diagnosis of meconium aspiration were studied. Results: Total deliveries during this period were 18272 out of which 4567 (24.99%) had meconium stained liquor. One hundred and eight cases were diagnosed as meconium aspiration, out of which 20 were classified as sub-clinical meconium aspiration and 88 had definite evidence of aspiration. The study showed a higher incidence of meconium aspiration (0.486%) but lower ventilation rate (9.4%) as well as mortality (2.3%). Three point four percent (3.4%) babies were diagnosed as having persistant foetal circulation (PFC). Sex ratio (male:female) birth weight gestational age, and apgar score at 1 minute and 5 minutes were comparable to other studies. Respiratory distress occurred in 97.72% and meconium was recovered from trachea in 86.35%. Two point three percent (2.3%) babies did not develop any significant respiratory distress despite meconium aspiration being present. Conclusion: The study shows higher incidence of meconium associated deliveries but comparable neonatal outcome to other studies, with less number of patients needing ventilation and decreased mortality.


Keywords: Meconium aspiration syndrome, endotracheal suction.

Meconium aspiration syndrome (MAS) still accounts for significant mortality among neonates in spite of some improvement in the outcome following the combined obstetric-pediatric approach used since the mid-seventies. The magnitude of the problem and outcome varies from one place to another depending upon characteristics of the patients as well as the obstetric and neonatal care practices.

The Neonatal Department of Madina Maternity and Children's Hospital (MMCH), Kingdom of Saudi Arabia, serves the whole Madina province, therefore most of the cases of MAS are dealt with in our hospital. Before embarking on a prospective study we thought it would be worthwhile to review and analyze the pattern of MAS retrospectively. No previous data is available from Saudi Arabia. The results were compared with other places.

Protocol of management of MAS in MMCH

All meconium associated deliveries were attended by the pediatrician. Routine intrapartum suction of oral cavity and nose was performed by the obstetrician before the delivery of anterior shoulder using a 10 FG catheter. Direct visualization of larynx was carried out by a Pediatrician and endotracheal suction performed, if the liquor contained thick particulate meconium. Suction was carried out through an endotracheal tube size 3 or 3.5 connected directly to suction apparatus and the tube was withdrawn under continuous negative pressure between 10-15 KPA. The patient was reintubated and the whole process was repeated until trachea was clear. The patients were intubated to a maximum of three times. No endotracheal lavage was used. The babies who were actively crying and those with thin meconium were not intubated unless for other reasons.

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Patients and methods  Study period: 1st August 1989 to 31 January 1991. Total live births were 18,272. The case notes of the babies admitted to the unit with a history of meconium stained liquor were studied. The diagnostic criteria for meconium aspiration syndrome were as follows:

(i) the history of meconium stained liquor
(ii) actual visualization of meconium below the vocal cords.
(iii) symptoms of respiratory distress not explained by any other cause.
(iv) presence of radiological features supporting diagnosis of MAS.

The following radiological features in various combinations were taken as evidence of MAS. The x-rays were reviewed by the radiologist and findings were interpreted in view of the clinical findings and history.

a) bilateral patchy atelectasis
b) coarse irregular streaky pattern
c) consolidations
d) hyperinflation
e) air leaks.

Cases of respiratory distress due to causes other than MAS were excluded. Modalities of treatment like surfactant therapy, high frequency ventilation etc. were not used because of their non-availability. The neonates diagnosed as persistent foetal circulation in association with MAS were treated with hyperventilation, alkali therapy and tolazoline.

Results  One hundred and eight patients were diagnosed as MAS, 88 of whom had definite evidence of MAS either clinical, radiological or both. The patient characteristics and outcome is given in Tables 1 and 2. Twenty patients who had a definite history of meconium stained liquor and significant respiratory distress were classified as sub-clinical MAS. These patients had no radiological features of MAS nor had produced any other cause to account for their respiratory distress.

In two patients meconium was aspirated below the vocal cords and their x-rays were abnormal. One had right upper lobe consolidation and the other pneumo-mediastinum with bilateral patchy opacities. They showed no clinical evidence of respiratory distress. A significant amount of meconium was aspirated from the trachea of both these babies under direct vision and they were transferred to our neonatal unit for close observation. The x-rays were taken before they were discharged. Persistent foetal circulation (PFC) was diagnosed in three patients on the basis of pre and post ductal blood gas analysis and echo cardiogram: Death occurred in two patients, both had associated PFC.

Discussion  The improvement of perinatal care in general and routine use of intrapartum suction of the oropharynx has led to a significant decrease in overall incidence and subsequent complications of MAS. However the mortality remains high particularly among those who require ventilation. Inadequate response to conventional ventilation has lead some researchers to use extracorporeal membrane oxygenation, (ECMO). This has shown substantial improvement in outcome although its routine use cannot be justified.

The incidence of meconium associated deliveries and MAS varies from one place to another due to variability of the factors affecting the quality of antenatal care practices, intranatal care and the characteristics of affected neonates. In our hospital the incidence of meconium associated deliveries was found to be 25%, compared to 12.5% as reported by Wiswell et al 1990 and 10%-15% by Ross et al 1989. These results give an indication of the unpopularity of antenatal care, and the delay in seeking medical advice until the onset of complications in the form of fetal distress. In the Al-Madina area, it has been estimated that the uptake of regular antenatal care by pregnant women was about 35% only.

The sex ratio, mean birth weight, Apgar score, mean gestational age and the mortality among

| Total deliveries (live borns) | 18,272 |
| Incidence of Mec. Associated deliveries | (4,567/18,272) = 24.99% |
| Total cases of definite MAS | 88 |
| Incidence of MAS | 0.48/100 Live Births |
| Sex: Male : Female | 1.57 : 1 |
| Saudi : Non-Saudi | 3 : 1 |

| Birth weight (Kg) | Mean±(SD) | Range |
| 3.13 (0.54) | 1.42 - 4.18 |
| Gestational age (weeks) | 39.86 (1.45) | 36 - 43 |
| Apgar score: 1 min | 4.64 (2.44) | 0 - 9 |
| 2 min | 7.85 (1.95) | 1 - 10 |

| Meconium in trachea | 76 | 86.36 |
| Respiratory distress | 86 | 97.72 |
| Radiological evidence of MAS | 54 | 61.36 |
| Ventilated | 8 | 9.09 |
| Air leaks | 13 | 14.77 |
| Paralyzed (pancuronium) | 6 | 6.81 |
| P.F.C. | 3 | 3.40 |
| Deaths | 2 | 2.27 |
ventilated babies was comparable to two previous published studies by Collart 1989 and Wiswell 1990. The number of babies needing ventilation and total mortality was significantly lower. Despite inadequate antenatal care and high incidence of meconium stained liquor the lower mortality rate was unexpected. This can only be explained by either differences in management or population characteristics. The differences in the outcome among different populations has been suggested by Roloff DW 1992.13 There have been various methods of suction used to prevent MAS.14,15,16

a) endotracheal intubation and covering the end of endotracheal tube (ETT) with gauze and sucking by mouth.
b) through a catheter directly passed through ETT.
c) modified Delee suction apparatus.
d) connecting endotracheal tube directly to the tube of suction apparatus and removing the ETT under negative suction.
e) various mechanical devices, commercially available for removing meconium.

The negative pressure generated in the trachea as a result of suction may have had a direct effect on the amount of meconium aspirated and the extent of subsequent alveolar collapse. The method used in our hospital was intubation with the largest possible size of ETT (usually 3 or 3.5), the adaptor of which was directly connected to the modified tube of suction apparatus. The ETT was withdrawn under constant negative pressure of 10 - 15 K.P.A. The whole process was repeated until the trachea was clear. Following this, the patient was given a few breaths with bag and mask to expand any collapsed alveoli due to negative pressure and routine resuscitation was continued as required. This probably reduced the need for ventilation by removing more meconium, thus leading to better outcome. Slight increase in air leaks was not significant as this did not affect mortality.

Management of MAS complicated with PFC using nitric oxide, extra extracorporeal membrane oxygenation, surfactant therapy and high frequency ventilation is well proven. These are not available at many centers. MacFarlene and Heaf followed up 18 children with MAS. They found that prevalence of asthmatic symptoms and bronchial hyperactivity was much higher among survivors of meconium aspiration syndrome patients than the general population. Thus prevention of meconium aspiration itself can decrease the mortality and long term morbidity. Fetal sedation and intraamniotic saline infusion are being tried to prevent MAS, but their efficacy has not been proved.20,21

Joint Committee of American Academy of Pediatrics and American Heart Association does not recommend routine use of intubation in vigorous babies born with meconium stained liquor.22 Wiswell et al 1992 has shown that such babies had increased chances of developing MAS and air leaks if routine suction is not performed.23 Further controlled studies are required to resolve the existing controversies regarding the routine use of endotracheal suction, the amount of negative pressure and technique of suction.24,25 The direct endotracheal suction under negative pressure of 10-15 KPA and repeated intubations up to a maximum of three times, as carried out in our unit, seem to be safe and effective. Further studies are needed to understand the differences in the perinatal aspects of the disease that may explain the variations in the outcome among the various populations.

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References