Study of risk factors, clinical profile, and outcome in meconium-stained deliveries

Omprakash S Shukla[1], S T Swapna[2]

From [1]Professor, [2]Resident, Department of Pediatrics, Sir Sayajirao General Hospital and Medical College, Vadodara, Gujarat, India

Correspondence to: Dr. S T Swapna, F-103, Darshanam Central Park Appartments, Sayajigunj, Vadodara, Gujarat, India. E-mail: getrealwithdimple@gmail.com

Received - 15 February 2019 Initial Review - 18 April 2019 Accepted - 27 April 2019

ABSTRACT

Background: The presence of meconium in amniotic fluid is a serious sign of fetal distress which leads to an increase in neonatal mortality. **Objective:** The objective of this study was to study the risk factors, clinical profile, and outcome of babies born through meconium-stained fluid. **Materials and Methods:** This prospective observational study was conducted during the period from February 2018 to October 2018 at neonatal unit of a tertiary care hospital. All live babies delivered through meconium-stained liquor were included in this study. Routine investigations such as complete blood count and C-reactive protein were done in all the patients. All the variables were analyzed with the help of the Chi-square test and Fisher's exact test. **Results:** A total of 606 meconium-stained amniotic fluid (MSAF) babies were included in the study. Most of the MSAF babies were term, appropriate for gestational age babies. The number of babies delivered through the lower segment cesarean section was 61.7%. Fetal distress was present in 23.2% of the cases. Otherwise, the most common risk factor associated with MSAF was pre-eclampsia (5.9%). A total of 58.2% of babies developed respiratory distress after birth; other morbidities associated were convulsion, hypoxic-ischemic encephalopathy, sepsis, shock, hypoglycemia, and hyperbilirubinemia. In the present study, total mortality in MSAF babies was 12%. Babies who expired had severe meconium aspiration syndrome. Duration of hospital stay was <7 days in 83.9% of the neonates, of which 14% expired and 85% were discharged. All the mortalities in our study except one occurred within 7 days of life. **Conclusion:** MSAF is associated with significant morbidity and mortality in neonates. Mortality was more in non-vigorous babies and in those who developed severe meconium aspiration syndrome and pulmonary hypertension of the newborn. Other morbidities did not have a strong association with MSAF.

Key words: *Clinical profile, Meconium aspiration syndrome, Meconium-stained amniotic fluid, Outcome*

The presence of meconium in amniotic fluid is a serious sign of fetal distress which leads to an increase in neonatal mortality [1]. Even in women who are at very low risk for obstetric complications, meconium-stained amniotic fluid (MSAF) is common and it is associated with a 5-fold increase in perinatal mortality as compared with low-risk patients with clear amniotic fluid [2]. The incidence of MSAF occurs in 10–15% of live birth. 5% of babies born through MSAF developed meconium aspiration syndrome (MAS) and mortality due to MAS occurs in 3–5% of neonates [3]. Meconium passage increases after 37 weeks of gestation; MSAF is associated with higher rates of cesarean delivery [1].

Aspiration of meconium can occur *in utero*, during birth, or after birth. Causes of the passage of meconium *in utero* are – (a) Post-term fetus with increasing motilin levels and normal gastrointestinal function, (b) vagal stimulation produced by cord compression, (c) *in utero* fetal stress [4], and (d) maternal and fetal factors such as hypertension, gestational diabetes mellitus (GDM), chronic respiratory or cardiovascular diseases, post-term pregnancy, pre-eclampsia, eclampsia, oligohydramnios, intrauterine growth restriction, and poor biophysical profile [5].

Chronic or acute hypoxia, acidosis, and infection can lead to severe MAS [4]. The study was carried out to determine the risk factors, clinical profile, and outcome of the neonates born through MSAF.

MATERIALS AND METHODS

A prospective observational study was conducted from February 2018 to October 2018 at a neonatal unit of a tertiary care hospital, Vadodara. All the neonates delivered with MSAF were included in the study after obtaining Scientific Review Committee on Human Research of the hospital approval. The delivery of all the meconium-stained liquor babies was attended by trained personnel in Neonatal Resuscitation Program (NRP) and detailed antenatal history such as pregnancy-induced hypertension, pre-eclampsia, and GDM, and natal history like fetal distress were taken. Apgar scoring was done in all newborns with MSAF. According to the requirement, resuscitation was done for all the babies. Only initial steps of resuscitation were required for active and vigorous babies; otherwise, resuscitation was done as per the general guidelines. After resuscitation, all the babies

were shifted to neonatal intensive care unit for further observation and monitoring. Detailed general examination and systemic examination were done in all babies with MSAF.

Routine investigations such as complete blood count and C-reactive protein were done in all patients. The blood culture was sent selectively for those patients who had clinical symptoms, risk factors for sepsis those who developed any complications. Chest X-ray was done in non-vigorous babies and in those who developed respiratory difficulty after birth. In patients with severe MAS and persistent pulmonary hypertension of newborn (PPHN), arterial blood gas (ABG) analysis was also done. PPHN was defined by both clinically and by performing echocardiography (Echo). Severe PPHN was defined by Grade III tricuspid regurgitation (TR) in Echo. Development of respiratory complications and non-respiratory complications such as convulsion, sepsis, and shock was monitored in all patients. Echo was done in all patients with suspected PPHN; severe PPHN (Grade III TR) was noted in 42 babies. The different treatment modalities used for the patients (oxygen support, ventilation, antibiotics, and vasopressors) were noted. Finally, the outcome of the patients in the form of discharge or expiry was noted. Duration of stay in the hospital in all discharged and expired babies were noted. Age at death of expired cases was also noted.

The relevant data were collected and tabulated in Microsoft Excel sheet. All the variables were analyzed with the help of the Chi-square test and Fisher's exact test. Significance was noted when $p<0.05$.

RESULTS

A total of 606 neonates delivered through MSAF were enrolled in the present study. Of 606 cases, 553 cases were of >37 weeks gestation. In the study population, 51.3% were male and 48.6% were female with a male:female ratio of 1.05:1. Of 606 cases, 385 cases were >2.5 kg and 517 cases were appropriate for gestational age (AGA). There were 65.8% of cases from the rural area with a rural:urban ratio of 1.9:1 and 8 patients were from the tribal community. A total of 374 (61.7%) neonates were delivered through lower segment cesarean section (LSCS) method in this study.

Of 606 neonates, 568 (93.7%) MSAF babies were vigorous and 38 (6.2%) babies were non-vigorous. Fetal distress was present in 144 (23.7%) babies, of which 30 were non-vigorous. Fetal distress is defined by non-stress test as <2 accelerations in 40 min. The most common risk factor associated was pre-eclampsia, which was present in 5.9% of the cases. In this study, 2.8% of the cases had oligohydramnios and 1.5% of the cases had prolonged labor as the risk factor (Table1).

In the study population, 58.2% of babies developed respiratory distress after birth and other morbidities associated were convulsion in 2.1% of cases, sepsis in 16.8% of cases, shock in 11.8% of cases, hypoxic-ischemic encephalopathy (HIE) in 2.8% of cases, hyperbilirubinemia in 7.9% of cases, and hypoglycemia in 1 baby (Table 2). As per Apgar scoring, 45 babies had birth asphyxia. We had not done cord ABG to know birth asphyxia. HIE developed in 17 babies; there was no relation with hepatitis B surface antigen positivity and MSAF.

Blood culture was positive in only 4.9% of cases. Blood culture was sent only for those patients who had risk factors, clinical sepsis, and in those with respiratory distress.

MAS developed in 170 (28%) babies, of which 73 (42.9%) babies expired; these expired babies had severe MAS. Of 42 babies with PPHN, 34 (80%) babies expired. Of 2 neonates with pneumothorax, 1 (50%) baby expired, and of 7 babies with pulmonary hemorrhage (pulmonary hemorrhage is a complication of MAS), all of them (100%) expired. High-frequency oscillatory ventilation was not used in the setup of the current study due to non-availability of the same.

In our study, 32.5% of babies required antibiotics; antibiotics were given to all patients who had risk factors and those who were septic screen positive. Inotropes were given to 14.3% of babies, 7.2% of them required sildenafil, and 32 patients required vasopressor support in the form of milrinone for the treatment. Conventional mechanical ventilation was used in all the 121(19.9%) patients who required mechanical ventilation; of which, 73 (12%) expired. Most of the babies were started with intermittent positive-pressure ventilation (PPV) mode initially and then changed over to synchronized intermittent mandatory ventilation (IMV) in babies who improved. The babies who deteriorated were put on IMV mode of ventilation. In our study, of 606 neonates, 528 (87.1%) babies were discharged without

Table 1: Distribution of risk factors in MSAF delivered babies

Risk factor	n (%)
Prolonged labor	10 (1.5)
Oligohydramnios	17 (2.8)
Pre-eclampsia	36 (5.9)
Anemia	3 (0.4)
HBsAg positive	8 (1.3)
Heart disease	1 (0.1)
Fetal distress	144 (23.7)
Polyhydramnios	4 (0.6)
GDM	1 (0.1)
Hyperthyroidism	2 (0.3)

GDM: Gestational diabetes mellitus, MSAF: Meconium-stained amniotic fluid, HBsAg: Hepatitis B surface antigen

Table 2: Distribution of morbidity profile

Morbidity profile	Frequency (%)
Respiratory distress	353 (58.2)
PPHN	42 (6.9)
Pneumothorax	2 (0.3)
Convulsion	13 (2.1)
Sepsis	102 (16.8)
Shock	72 (11.8)
HIE	17 (2.8)
Hypoglycemia	1 (0.1)
Hyperbilirubinemia	48 (7.9)

PPHN: Pulmonary hypertension of newborn, HIE: Hypoxic-ischemic encephalopathy

developing MAS or any of its complications, 73 (12%) babies expired, and 5 babies left against medical advice. Of 72 neonates with Apgar score <7 at 1 min, 38 (52.7%) neonates expired and of 34 neonates with <7 Apgar at 5 min, 26 (76.4%) expired, which shows a significant statistical correlation between Apgar score <7 and expiry with p=0.02. Of 568 vigorous babies, 526 (92.6%) of them got discharged and of 38 non-vigorous babies, 36 (94.7%) babies expired, which shows a significant statistical correlation between non-vigorous babies and expiry with p<0.0001 (Table 3). In the delivery room, of all MSAF babies in the vigorous category, all the babies were given routine care only. In the non-vigorous category, all of the babies (38) required intubation with PPV in the delivery room itself and tracheal suctioning was not done in any of the babies.

Of 568 vigorous babies, 42 developed PPHN and expired. Of 38 non-vigorous babies, 36 developed severe MAS and PPHN and expired. These babies were resuscitated as per NRP protocol, but subsequently, they expired due to severe MAS.

Of 122 neonates who required mechanical ventilation, 73 (59.8%) babies expired and 99.3% of neonates who did not require mechanical ventilation were discharged, which shows a significant statistical correlation between the requirement of mechanical ventilation and their outcome with p<0.00001. The neonates (95.5%) who required oxygen prongs and 96.3% of neonates who required oxygen hood were discharged and 86% of the neonates who did not require oxygen prongs and 79.4% of neonates who did not require oxygen hood were discharged. Most of the neonates who required oxygen were discharged. There was 13% expiry in neonates who did not require oxygen prongs and 20.2% expiry in neonates who did not require oxygen hood because these babies were directly intubated and required oxygen through PPV and not through oxygen prongs or hood box; hence, they expired due to the disease. They did not wean off from mechanical ventilation. High flow nasal cannula was not available in our setup. Of 121 MAS patients who required mechanical ventilation, 59.5% expired and 38.8% discharged. All MAS patients who did not require mechanical ventilation were discharged, which shows a significant statistical correlation between mechanical ventilation in MAS patients and their expiry with p<0.00001.

Of 87 babies who required inotropes, 82% of them along with 81.8% of neonates who required sildenafil and 84.3% of neonates who required vasopressor in the form of milrinone expired. A total of 83.9% of the patients stayed for <7 days in the hospital, of this 85% were discharged and 14% expired. Only 16% of the patients stayed for >7 days, of which 94% were discharged and 1% expired. In this study, 98.6% of neonatal deaths occurred within 7 days and only one patient expired on the 9th day of life.

Table 3: Correlation between vigorousity and outcome

	n	Discharged	Expired	p-value
Vigorous	568	526	42	<0.0001
Non-vigorous	38	2	36	

DISCUSSION

Chandran *et al*. found 83% of MSAF neonates after 37 weeks of gestation which matches with our study. The same study also showed a similar gender distribution pattern of 51% of males and 49% of females, which is almost similar to our study [6]. The study done by Ramakishore *et al*. showed that 78% of the neonates were >2.5 kg, which is higher than our study [7]. The study done by Joseph *et al*. showed that MSAF was more in small for gestational age (SGA) babies who do not match with our study [8]. In our study, AGA babies associated more with MSAF. In our study, 68 (11.2%) babies were SGA and 517 (85.3%) were AGA with MSAF. The study done by Chaudhary *et al*. showed that 45 patients (54.2%) delivered by LSCS and 38 (45.7%) babies were delivered by vaginal delivery, which is almost similar to our study [9]. The study done by Sadaf *et al*., Pakistan, 2008, had a similar 5% of cases with preeclampsia [1]. However, the study done by Mundhra *et al*., 2011, reported 16.97% of cases with pre-eclampsia [2]. This study also reported 21.81% of cases with the MSAF having fetal distress, which is similar to our study.

The study done by *Divia et al*. showed that respiratory distress present in 8.4% cases, birth asphyxia in 15.5% cases and sepsis in 2.42% cases, which does not match with our study [10]. Birth asphyxia was there in 45 (7.4%) babies as per Apgar scoring. Cord ABG was not done in our study. The study done by Singh *et al*. showed that 9.6% of patients had positive blood culture which does not match with our study [11]. The study done by Harerimana *et al*. showed inotropic requirement in 52.8% of patients and sildenafil in 12.5% of patients, which does not match with our study [12]. Echo was done in all patients with suspected PPHN; severe PPHN (Grade III TR) was noted in 42 babies. The study done by Chaudhary *et al*. showed 81.9% of patients discharged and 15.6% babies expired which is similar to our study [9] The study done by Harerimana *et al*. showed that there was no statistical correlation between discharge and expiry with Apgar score at 5 min with p=0.95, which does not match with our study [12]. The study done by Viraraghavan *et al*. showed that mortality was significantly higher in the non-vigorous than vigorous neonates (p<0.001). This matches with our study [13].

The study done by Chaudhary *et al*. showed that of 83 MAS babies, 68 babies (81.93%) were treated conservatively and 15 babies (18.07%) were ventilated. Among these 15 ventilated babies, only two babies were saved from death while the other 13 babies died. This finding was almost similar to our study [9]. In our study, of 568 vigorous babies, 10.7% developed severe MAS later on and required PPV and then died. Of 38 non-vigorous babies, 94.7% developed severe MAS and died. The FiO_2 requirement was high in these babies and they required FiO_2 of > 80%.

The study done by Harerimana *et al*. showed that of 38 patients that required inotropes, 72% expired and 42% discharged, i.e., the use of inotropes was associated with poor outcome. This is almost similar to our study. The same study also showed that of 20 patients who required vasodilators, 40% expired and 23% discharged, which does not match with our study [12]. In our study, more patients stayed for <7 days in the hospital because

most of the patients who did not develop MAS were discharged before 7 days and most of the expiry was within 7 days. The study done by Harerimana *et al*. showed that hospital stay was longer in patients who were discharged after developing any of the respiratory complications, which is similar to our study [12]. In our study, patients who required <7 days of hospital stay include all expired cases except one, and all MSAF delivered babies without any complications. Those babies without any complications were discharged within 72 h of life. Most of the babies who required >7 days of hospital stay were discharged after treating the complications developed due to MSAF and only one baby expired in this category. The study done by Singh *et al*. showed that most neonatal deaths occurred between 1 and 7 days, which are similar to our study [11].

CONCLUSION

There is a significant association between <7 Apgar score and non-vigorous babies at birth and death. Mortality is more in patients with severe MAS and PPHN. The requirement of mechanical ventilation is also associated with more number of deaths in MSAF babies. Reduction in maternal risk factors such as pre-eclampsia, *in utero* transfer to higher centers, and proper monitoring of high-risk pregnancies, and timely interventions such as resuscitation, early detection of complications, and proper management can reduce the morbidities and mortalities occur due to MSAF.

REFERENCES

1. Sadaf R, Mehrunnisa K, Khanum F, Zahid M, Khan S. Fetal outcome in deliveries of patients with meconium stained liquor. J Med Sci 2012; 20:165-7.
2. Mundhra R, Agarwal M. Fetal outcome in meconium stained deliveries. J Clin Diagn Res 2013;7:2874-6.
3. Kliegman R, Bonita S, St Geme J, Stoll N. Nelson Textbook of Pediatrics. In: Nelson Textbook of Pediatrics. 1st ed. Philadelphia: Elseivier Saunders; 2015. p. 859-62.
4. Eichenwald E, Hansen A, Martin CS. Cloherty and Stark's Manual of Neonatal Care. 8th ed. Philadelphia: Wolters Kluwer; 2017. p. 404-34.
5. Gavhane B, Thakare S, Wankhede S. The study of meconium staining of amniotic fluid and foetal outcome. Int J Reprod Contracept Obs Gynecol 2018;7:4042-7.
6. Chandran JR, Devi U, Rajeshwary U. Risk factors for meconium aspiration and MAS (meconium aspiration syndrome) in neonates born through meconium stained amniotic fluid (MSAF). J Evol Med Dent Sci 2013; 2:9489-95.
7. Ramakishore AV, Subramanyam KL, Mahesh G. A study on meconium aspiration syndrome cases attending to government general hospital, Anantapuramu, Andhra Pradesh. Int J Res Health Sci 2015;3:169-73.
8. Joseph K, Udaykiran G, Reddy DR, Jain CS. Incidence of meconium aspiration syndrome and associated risk factors in babies born to mothers with meconium stained amniotic fluid. Int J Contemp Med Res; 2015;4. Available from: http://www.ijcmr.com. [Last accessed on 2018 Dec 15].
9. Chaudhary R, Sethi RS, Chaurasiya OS, Sethi AS. Study of meconium aspiration syndrome in relation to birth weight and gestational age. Peoples J Sci Res 2018;11:16-21.
10. Divia A. Study on Risk Factors and Perinatal Outcome in Meconium Stained Liquor, Dissertation; 2018. p. 64-70.
11. Singh G, Singh O, Thapar K. Neonatal outcome in meconium stained amniotic fluid: A hospital based study. Int J Contemp Pediatr 2017;4:356-60. Available from: http://www.ijpediatrics.com/index.php/ijcp/article/view/434/468. [Last accessed on 2018 Nov 08].
12. Harerimana I, Ballot DE, Cooper P. Retrospective review of neonates with persistent pulmonary hypertension of the newborn at charlotte maxeke johannesburg academic hospital. South African J Child Health 2018;12:29-33. Available from: http://www.sajch.org.za/index.php/sajch/article/view/1414. [Last accessed on 2018 Nov 08].
13. Viraraghavan VR, Nangia S, Prathik BH, Madarkar BS, Deepshika R, Saili A. Yield of meconium in non-vigorous neonates undergoing endotracheal suctioning and profile of all neonates born through meconium-stained amniotic fluid: A prospective observational study. Paediatr Int Child Health 2018;00:1-5. Available from: http://www.tandfonline.com/action/journalInformation?journalCode=ypch20. [Last accessed on 2018 Nov 08].

Funding: None; Conflict of Interest: None Stated.

How to cite this article: Shukla OS, Swapna ST. Study of risk factors, clinical profile, and outcome in meconium-stained deliveries. Indian J Child Health. 2019; 6(5):213-216.

Doi: 10.32677/IJCH.2019.v06.i05.005