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Original Research Article

Study of respiratory complications and outcome in meconium stained deliveries

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ABSTRACT

Background: To study the development of respiratory complications in the form of meconium aspiration syndrome (MAS), persistent pulmonary hypertension of newborn (PPHN), pulmonary hemorrhage and pneumothorax in neonates born through meconium stained liquor.
Methods: It was a prospective study conducted during the period of February to October 2018. All live babies associated with meconium stained liquor were included.
Results: Total 606 neonates with meconium stained amniotic fluid (MSAF) were enrolled. Chance of meconium passage was more after 37wk of gestation, in birth weight >2.5 kg and in AGA babies. The rate of LSCS was higher in MSAF group. MAS developed in 28% cases, out of which 42.9% expired. PPHN developed in 6.9% cases, out of which 80% expired. 100% mortality was there in babies with pulmonary hemorrhage. Apgar scores <7 is significantly associated with the development of respiratory complications. 22.8% of vigorous babies and all non-vigorous babies developed respiratory complications showing statistical significance with P-value of <0.00001. Mortality in MSAF was 12%. All babies who expired had severe meconium aspiration syndrome. 83.9% of the patients stayed for <7 days in the hospital. All of the expiry except one occurred within 7 days of life due to development of respiratory complications.
Conclusions: MSAF is associated with the development of respiratory complications and mortality in neonates. Non-vigorous babies and the babies with Apgar scores <7 at birth are more prone to developing respiratory complications. Most of the MSAF babies were discharged and mortality was more in patients with respiratory complications.

Keywords: Apgar score, Meconium aspiration syndrome, Meconium stained amniotic fluid, Respiratory complications

INTRODUCTION

Infants born through the meconium-stained amniotic fluid are about 100 times more likely to develop respiratory distress compared to their counterparts born through the clear fluid.[1] Out of total deliveries, 10-15% babies were born through meconium stained amniotic fluid. Meconium aspiration syndrome developed in 5% of those babies born through meconium stained fluid. Mechanical ventilation was required in 30% of babies with MAS. About 3-5% of babies died due to meconium aspiration syndrome.[2] Meconium passage is rare before 34 weeks of gestational age. Meconium passage occurs in up to 20% of term gestations and can occur in more than 35% of pregnancies continuing beyond 42 weeks gestation. Meconium passage most commonly occurs in small-for gestational-age and postmature infants.[3]In the presence of fetal stress, gasping by the fetus can result in aspiration of meconium before, during or immediately following delivery. Severe meconium aspiration syndrome is

caused by a pathologic intrauterine process, chronic hypoxia, acidosis and infection.[4] The most prominent and consistent physiological effect resulting from meconium injury are hypoxemia and decreased lung compliance. The decreased lung compliance may be related to hyperinflation secondary to ball-valve airway obstruction or in most of the cases can lead to atelectasis.[5] Considering the risks associated with meconium-stained deliveries, the study was undertaken to determine the adverse outcome, mainly concentrating on the requirement of respiratory supports and respiratory complications related to these deliveries.

METHODS

This study was conducted in babies delivered in the neonatal unit of Pediatrics Department at tertiary care hospital in Vadodara with meconium-stained amniotic fluid from February 2018 to October 2018 and it was a prospective observational study.

The study was approved by the Scientific Review Committee on Human Research of the hospital. All neonates delivered through MSAF were included.

With the proper consent of parents/ guardians; a detailed antenatal, natal and postnatal history of the mother and baby were taken, followed by a thorough general and systemic examination of the newborn in every enrolled case. All deliveries with meconium stained liquor were attended in the labor room or in the operation theatre. Apgar score was noted in all newborns. If the baby was vigorous and active, only initial steps were required. If the baby was non-vigorous, resuscitation measures as per the algorithm were required. Some babies required only bag and mask ventilation, some required endotracheal intubation. Some babies required chest compression and adrenaline also. All babies with MSAF were shifted to NICU after resuscitation. In NICU, detailed general examination and systemic examination was done in all babies. Respiratory system examination including Downes score (Table 1) was done in all patients.

Table 1: Downes score.

Criteria	Score 0	Score 1	Score 2
Cyanosis	None	In room air	In 40% fio2
Retraction	None	Mild	Moderate to severe
Grunting	None	Audible with stethoscope	Audible without stethoscope
Air entry	Normal	Decreased	Barely audible
Respiratory rate	<60	60-80	>80 or apnea

Score >4 indicates respiratory distress, Score>6 indicates respiratory failure, requiring mechanical ventilation.

Different type of respiratory supports was decided according to the Downes score. Oxygen support by hood or prongs were given to patients with Downes score between 4 and 7. Patients with Downes score more than 6 required mechanical ventilation. Complete blood count and C-reactive protein were done in all babies. In patients who developed respiratory distress, chest x-ray was done and in patients who developed any of the complications, blood culture was sent. All the patients were further monitored for development of any respiratory complications like MAS, PPHN, pneumothorax and pulmonary hemorrhage. Meconium aspiration syndrome was diagnosed in patients who delivered through meconium-stained amniotic fluid and developed respiratory distress after birth along with abnormal chest x-ray.

The severity of MAS was decided according to the requirement of respiratory support.

- Mild MAS-required <40% oxygen for <48 hours.
- Moderate MAS-required >40% oxygen for >48 hours.
- Severe MAS-required assisted ventilation >48 hours.

Persistent pulmonary hypertension was clinically diagnosed by pre-ductal and post-ductal saturation difference of >10%. 2D Echo was done in those patients with PPHN to rule out any other structural heart disease. In patients with severe MAS and PPHN, arterial blood gas analysis was also done. The patients were progressively observed and treated in accordance with the complications developed and the outcome of all the neonates was noted. Duration of stay in the hospital and age at death of expired cases were also noted.

Statistical analysis

All the relevant data was collected as per proforma and tabulated in Microsoft Excel and was analyzed using statistical software. Chi-square test and Fischer's exact test was applied between the different associations. If the p-value was <0.05, it was considered as significant.

RESULTS

During the study period, 606 neonates had meconium stained liquor. 91.2% cases were of >37 weeks gestation. 311 patients were males and 295 were females with a male: female ratio of 1.05:1. 63.5% cases with MSAF were of >2.5 kg and 85.3% cases belonged to AGA. In, 78% of neonates belonged to the Hindu community. 61.7% of the cases were delivered by LSCS. 84.8% of mothers were between 21 to 30 years and 66.1% of them were primigravida. A 23.2% of the newborns had fetal distress in. A 93.7% of MSAF babies were vigorous and 6.2% were non-vigorous. A 23.7% babies required only initial steps of resuscitation, whereas 12.8% neonates required oxygen, 10.2% babies required bag and mask and 8.9% babies required intubation and only 4 patients required chest compression, adrenaline and volume expander for resuscitation. In NICU, 19.8% babies

required mechanical ventilation and oxygen prongs and hood required by 11.3% and 11.5% babies respectively. Out of 606 neonates, 170 patients developed respiratory complications. All of them had severe meconium aspiration syndrome, out of which 42.9% expired. 31.7% of babies developed mild MAS, 11.1% of babies developed moderate MAS and 97 (57%) of babies developed severe MAS. 42 (24.7%) babies developed PPHN, out of which 80% expired. 2 (1.6%) developed pneumothorax, out of which 50% expired. A 7(5.8%) babies developed pulmonary hemorrhage. All babies with pulmonary hemorrhage expired (Table 2).

Table 2: Distribution according to the respiratory complications and mortality.

Complications	Morbidity	Percentage	Mortality	Percentage
MAS (N=606)	170	28	73	42.9
Mild MAS (N=170)	54	31.7	0	0
Moderate MAS (N=170)	19	11.1	0	0
Severe MAS (N=170)	97	57	73	42.9
PPHN (N=170)	42	24.7	34	80
Pneumothorax (N=170)	2	1.6	1	50
Pulmonary hemorrhage (N=170)	7	5.8	7	100

Table 3: Correlation between Apgar score <7 at 1 and 5 min with respiratory complications.

APGAR score <7	N	Respiratory complications present	Respiratory complications absent	P-value
At 1 min	72	61	11	0.01
At 5 min	34	34	0	

Table 4: Correlation between vigorousity and respiratory complications.

Vigorousity	N=606	Respiratory complication present	Respiratory complication absent	P-value
Vigorous	568	130 (22.8%)	438 (77.1%)	<0.00001
Non- vigorous	38	38 (100%)	0	

Out of 606 neonates, 28.2% of them had abnormal chest x-ray and acidosis present in 5.9% cases. Chest x-ray was done in 353 patients, out of which 48.4% were abnormal. ABG was done in 67 patients, out of which 53.7% had acidosis. Out of 170 patients with MAS, all of them had an abnormal chest x-ray and 21.1% of them had acidosis. An 87.1% of the patients got discharged, 12% of them expired and 5 neonates left against medical advice. Out of 73 expired cases, all of them had severe meconium aspiration syndrome. In, P-value derived showed statistical significance between gender and development of respiratory complications. More male babies developed respiratory complications in. Apgar scores less than 7 at 1minute and 5 minutes were significantly associated with the development of respiratory complications with a P-value of 0.01 (Table 3).

Out of 353 patients with respiratory distress, 158 patients developed respiratory complications, which shows strong statistical significance between respiratory distress and respiratory complications with a p-value of <0.0001. Out of 568 vigorous babies, 22.8% neonates developed respiratory complications whereas all non-vigorous babies developed respiratory complications, which shows a significant statistical correlation between non-vigorous babies and development of respiratory complications with a P-value of <0.00001 (Table 4).

Out of 170 patients with MAS, 73 (42.9%) babies expired and 92 (54.1%) of them were discharged. All neonates who did not develop meconium aspiration syndrome were discharged, which shows a significant statistical correlation between meconium aspiration syndrome and their outcome with a P-value of <0.00001 (Table 5).

Out of 42 patients with PPHN, 35 (83.3%) babies expired. Out of 128 MAS babies without PPHN, 85 (66.4%) neonates were discharged, which shows a significant statistical correlation between PPHN and expiry with a P-value of <0.0001 (Table 6).

Table 5: Correlation between mas with outcome.

Complicatior	N	Discharged	Expired	P-value
MAS	170	92	73	<0.00001
MAS absent	456	456	0	

In, all patients except one with abnormal chest x-ray had respiratory complications. There is strong statistical significance between an abnormal chest x-ray and

development of respiratory complications with a p-value of <0.00001. Out of 170 patients with respiratory complications, 73 (42.9%) had <7 days hospital stays. 97 (57%) patients stayed for >7days. All patients who stayed for <7 days with respiratory complications expired. All patients who stayed for >7 days, were survived after developing complications.

Table 6: Correlation between PPHN in MAS patients with outcome.

PPHN	N=170	Discharged	Expired	P-value
Present	42	7	35	<0.0001
Absent	128	85	38	

DISCUSSION

The risk for meconium staining of amniotic fluid increased with more than 37 weeks gestational age, more than 2.5 kg birth weight and AGA babies. The study done by Gupta V et al, also showed more cases of MSAF after 37 weeks of gestation.[6] The study done by Joseph K et al, showed a similar gender distribution pattern of 57.2% males and 42.5% females, as present study.[7] The study done by Singh G et al, showed that 76% of the neonates were more than 2.5 kg, which is higher than present study.[8] LSCS delivery was more in MSAF babies. The study done by Rokade J et al, showed that 111 patients (56%) delivered by L.S.C.S which is almost similar to present study.[9] Most common maternal age group was between 21 to 30 years which can be comparable to the study done by Vaghela HP et al.[10] A 93.7% of babies were vigorous and 6.2% were non-vigorous in present study, which did not match with the study done by Viraraghavan VR et al.[11] The study done by Chaudhary R et al, showed that 15 babies (18.07%) required mechanical ventilation, which is similar to .[12] Akmal et al found out that 30% of babies developed MAS, which is similar to and mortality was 15% for those developing MAS. The mortality rate is high in present study.[13] The study done by Fischer et al showed that 15.7% of cases developed PPHN, which is lower than. Air leak was associated in 11% of MAS cases, which is higher than. Out of 3 cases of pulmonary hemorrhage in this study, all of them expired. In also, 100% mortality is there due to pulmonary hemorrhage.[14] The study done by Raman et al showed that all the patients with MAS had abnormal chest X-ray which is similar to. In patients with MAS, acidosis absents in 75% cases and present in 25% cases which match with the present study.[15] The study done by Ranee D et al, showed that Apgar <7 at 1 min was associated with MAS in 61 cases and Apgar >7 at 1 min was associated with MAS in 6 cases. There is a significant association between low APGAR score at 1 min and the development of MAS which is similar to the present study.[16] The study done by Viraraghavan VR et al, showed that 3% of vigorous babies and 21.7% of non-vigorous babies developed MAS, which showed statistical significance between non-vigorous neonates and development of MAS (p <0.001).[11] The study done by Gurmeet et al showed that 33% of the cases with MAS expired and 67% of cases with MAS were discharged, which is almost similar to the present study.[8] The number of discharged cases were more than expired cases in patients with MAS, which is similar to the present study. But all the expired cases in had severe MAS. The study done by Harerimana I et al, found that out of 72 neonates with PPHN, 25 (34.7%) did not survive. This doesn't match with the present study.[17] The study done by Gauchan E et al, showed that 98% of patients with abnormal chest x-ray developed MAS, which is similar to the present study.[18] All patients who stayed for <7 days with respiratory complications were expired. Duration of stay is more than 7 days in patients who survived after developed respiratory complications.

CONCLUSION

Meconium passage is more in full-term babies with >2.5 kg weight and in AGA babies. There is a significant association between <7 Apgar score and development of respiratory complications. Baby being non-vigorous at birth is significantly associated with the development of respiratory complications. Respiratory distress and abnormal chest x-ray had a significant association with respiratory complications. MSAF is associated with significant morbidity and mortality in new-born babies. Early detection, timely interventions like resuscitation, management can reduce the morbidities and mortalities associated with MSAF.

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