Original Research Article

A study of the different treatment strategies and outcome of babies with meconium stained amniotic fluid

Deepa Sachin Phirke[1], Bhavesh Shah[2*], Defairlin Ranee[3]

[1]Associate Professor, [2]Assistant Professor, [3]Resident, Department of Paediatrics Government Medical College, Miraj, Maharashtra, INDIA.
Email: dsphirke@gmail.com, shahbhavesh1010@rediffmail.com

Abstract

Background: Meconium aspiration syndrome (MAS) is defined as respiratory distress in an infant born through meconium-stained amniotic fluid (MSAF) with characteristic radiological changes and whose symptoms cannot be otherwise explained.It causes respiratory difficulty secondary to airway obstruction, chemical irritation, infection and surfactant inactivation. **Aims and Objectives:** To study the different treatment strategies and outcome of babies born through meconium stained amniotic fluid **Methodology:** This prospective study was conducted in NICU of department of Paediatrics of tertiary care centre from 1st January 2015 to 30th June 2016. Total 152 neonates meeting the inclusion and exclusion criteria constituted the material for this study. Detailed history and clinical findings were recorded in the predesigned proforma. All babies with meconium stained amniotic fluid were taken into study irrespective of the gestational age were included into study. The statistical software namely Open epi-info was used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs and tables etc. **Result:** Majority of the babies were asymptomatic, most of them improved with supplemental oxygen only. There was a strong association between Thick MSAF and MAS. Those babies who required immediate intubation and mechanical ventilation after delivery had a higher mortality rate. **Conclusion:** It can be concluded from our study that majority of babies with MSAF especially thin MSAF are asymptomatic and have a good outcome. Thick MSAF is associated with high chances of MAS and those babies who have severe MAS that require mechanical ventilation soon after birth have a poor outcome probably due to severe respiratory compromise and associated co-morbidities like severe birth asphyxia, sepsis and ventilator associated complications.

Key Words: Meconium stained amniotic fluid (MSAF), Meconium aspiration syndrome (MAS), Treatment of MAS.

[*]**Address for Correspondence:**
Dr. Bahvesh Shah, Assistant Professor, Department of Paediatrics Government Medical College, Miraj, Maharashtra, INDIA.
Email: dsphirke@gmail.com
Received Date: 20/05/2017 Revised Date: 17/06/2017 Accepted Date: 11/07/2017
DOI: https://doi.org/10.26611/1014317

Access this article online

Quick Response Code:

Website: www.medpulse.in

Accessed Date: 14 July 2017

INTRODUCTION

Meconium aspiration syndrome (MAS) is defined as respiratory distress in an infant born through meconium-stained amniotic fluid (MSAF) with characteristic radiological changes and whose symptoms cannot be otherwise explained[1]. Because meconium is rarely found in the amniotic fluid prior to 34 weeks' gestation, MAS is often a disease of the term and near-term infant and is associated with significant respiratory morbidity and mortality. Cleary and Wiswell[2] have proposed a severity criteria to define MAS: (a) mild MAS is a disease that requires less than 40% oxygen for less than 48 hours, (b) moderate MAS is a disease that requires more than 40% oxygen for more than 48 hours with no air leak, and (c) severe MAS is a disease that requires assisted ventilation for more than 48 hours and is often associated with PPHN. In this paper, we look at the current understanding of the pathogenesis and management of MAS. Meconium is a viscous sticky dark green substance containing gastrointestinal secretions, bile, bile acids, mucus, pancreatic juice, blood, swallowed vernix caseosa, lanugo, and cellular debris. Intrauterine hypoxia may

How to cite this article: Deepa Sachin Phirke, Bhavesh Shah, Defairlin Ranee. A study of the different treatment strategies and outcome of babies with meconium stained amniotic fluid. *MedPulse International Journal of Pediatrics.* July 2017; 3(1): 28-31.
http://medpulse.in/Pediatrics/index.php

cause passage of meconium in the amniotic fluid. MSAF is present in 8–20% of all deliveries [1–4], increasing to 23–52% after 42 weeks of gestation[5, 6]. Meconium aspiration may occur before birth, or during the birth process. About 2–9% of infants born through MSAF develop MAS[7–9]. About one-third of infants with MAS require intubation and mechanical ventilation[9].

MATERIAL AND METHODS

This prospective study was conducted in NICU of department of Paediatrics of tertiary care centre from 1st January 2015 to 30th June 2016.Total 152 neonates meeting the inclusion and exclusion criteria constituted the material for this study. Detailed history and clinical findings were recorded in the predesigned proforma. All babies with meconium stained amniotic fluid irrespective of the gestational age were included into study while Neonates with Transient Tachypnea of Newborn, Respiratory Distress Syndrome, congenital pneumonia and congenital heart disease with congestive cardiac failure were excluded from the study. All neonates with meconium stained amniotic fluid admitted in NICU of tertiary care center between 1st January 2015 to 30th June 2016, meeting the inclusion and exclusion criteria were included in the study. Procedure was explained to the parents and oral and written consent was taken. Study protocol was approved by institutional ethical committee. According to severity of respiratory distress as determined by Silverman Anderson score/Downe's score and ABG, the treatment Strategy was decided in the form of supplemental oxygen, mechanical ventilation: invasive/non-invasive, Surfactant, continuous positive airway pressure (CPAP).All neonates were managed as per the standard protocol of NICU with all aseptic care. Each neonate was followed till discharge or death and condition was noted at discharge as normal with or without sequelae. The data was collected on proforma and analyzed using descriptive statistics. The statistical software namely Open epi-info was used for theanalysis of the data and Microsoft Word and Excel have been used to generate graphs and tables etc.

RESULT

Table 1: Distribution of MAS in thick and thin MSAF

MSAF	MAS	Asymptomatic	Total
Thick MSAF	32	5	37
Thin MSAF	35	80	115
Total	**67**	**85**	**152**

P value-35.68; Chi-square<0.001 HS

There was significant association between thick MSAF and occurrence of MAS.

Table 2: Outcome of Babies Born With MSAF

Mature of MSAF	Discharge	Death	Total
Thick MSAF	23	14	37
Thin MSAF	115	0	115
Total	**138**	**14**	**152**

Chi-Square-47.93; P value-0.001

Table 3: Shows the distribution of cases according to modality of treatment

Modality of treatment	No. of cases (n)	Percentage (%)
On ventilation	18	12
On O2 by Hood/ CPAP	49	32
Not requiring O2	85	56
Total	**152**	**100**

In this study, as majority of the babies were asymptomatic, so majority of the babies did not require any treatment.

Table 4: Showing the outcome of MAS babies in ventilated and non ventilated babies

Modality of treatment	Discharge	Death	Total
Ventilated	4	14	18
O2 by hood/CPAP	49	0	49
Total	**53**	**14**	**67**

(Chi-Sq= 48.18, P-Value = 0.001 HS)

Table 5: Morbidity Pattern in MSAF Babies

Morbidity	No.of cases(n)	Percentage(%)
PPHN*	7	5
HIE**	12	8
Sepsis	19	12
NNH***	9	6

*Persistent Pulmonary hypertension**Hypoxic Ischemic encephalopathy***Neonatal hyperbilirubinemia

In this study, it was found that probable sepsis was the most frequent morbidity associated with MAS followed by HIE and hyperbilirubinemia.

Table 6: Outcome of Babies with MAS with or without co-morbidities

Associated Comorbidities	Discharge	Death	Total
Present	9	13	22
Absent	44	1	45
Total	**53**	**14**	**67**

Chi Square-28.91; P-value= 0.001 HS

There was a significant association between MAS with co-mobidities and the mortality. The co-morbid conditions that contributed to the mortality are severe birth asphyxia and sepsis. Thus majority of babies with MSAF especially thin MSAF were asymptomatic. While thick MSAF was strongly associated with development of MAS. Those babies with severe respiratory distress at birth and required immediate mechanical ventilation had higher mortality rate. There was a strong association between mechanical ventilation and mortality in MAS.

DISCUSSION

Supplemental oxygen administration is the mainstay of treatment for MAS and in majority of cases is the only therapy required.132Mechanical ventilation in a neonate with MAS is required only in severe cases of MAS and is challenging because of the complicated pulmonary pathophysiology resulting from areas of atelectasis and areas of hyperinflation, in association with ventilation-perfusion mismatch and airway compromise[10]. Approximately 40% of babies with MAS require mechanical ventilation and additional 10% require continuous positive airway pressure[11]. Indications for intubation of infants with MAS include (a) high oxygen requirement (FiO2 >0.8), (b) respiratory acidosis, with arterial pH persistently less than 7.25, (c) pulmonary hypertension, and (d) circulatory compromise, with poor systemic blood pressure and perfusion.135 There is little evidence from the clinical trials regarding the ventilator treatment of infants with MAS. Ventilation should be aimed at increasing oxygenation while minimizing the barotrauma that lead to air leak syndromes. The amount of ventilator support depends on severity of respiratory distress. Some infants only require oxygen by hood. In infants with MAS who have hypoxemia (PaO_2 < 50 mm Hg), hypercarbia ($PaCO_2$ > 60 mm Hg), or acidosis (pH less than 7.25) in an oxygen-enriched environment with an inspired oxygen fraction (FiO_2) > 0.6 are often considered candidates for mechanical ventilation. In infants with MAS without associated PPHN, it is sufficient to maintain a pH of 7.3–7.4, with a PaO_2 targeted between 60 and 80 mmHg and a $PaCO_2$ of 40–50 mmHg. Infants may be started with a moderate peak inspiratory pressure (PIP) preferably not exceeding 25 cm H_2O, a relatively rapid ventilator rate (40–60/min), a moderate positive end expiratory pressure (4–6 cm H_2O), and an adequate expiratory time (0.5–0.7 sec) to prevent gas trapping and air leaks. If gas trapping is noticed, expiratory time may be increased and PEEP should be decreased (3-4 cm H_2O)[10]. In infants with MAS and concomitant PPHN, mild hyperventilation and higher FiO_2 can be considered. But the strategy of achieving hypocapnia and alkalosis by hyperventilation has adverse effects including cerebral vasoconstriction leading to long-term neurologic morbidity as well as air leaks[12,13]. In such situations other modalities like inhaled nitric oxide and high frequency ventilation should be considered early. Theoretically High Frequency Ventilation (HFV) minimizes the barotrauma and may reduce air leak syndrome in MAS. No prospective randomized trials have compared conventional ventilation versus HFV in MAS. In pilot studies using inhaled nitric oxide (iNO), Kinsella and Abman[14] found that the combination of HFV and i NO caused the greatest improvement in oxygenation in some patients with severe PPHN. They speculated that improved lung inflation during HFV may augment the response to iNO by decreasing intrapulmonary shunting and improving i NO delivery to the pulmonary circulation[14,15]. Partial liquid ventilation was found to be a better method of delivering surfactant in an adult rat model of MAS when compared with conventional mechanical ventilation[16]. In our study we have found that there was a strong association between thick MSAF and mortality in MSAF babies.that majority of the babies especially with thin MSAF were asymptomatic, hence they did not require any treatment in the form of any respiratory support. In this study, there was a strong association that those babies who had severe respiratory distress at birth were immediately ventilated after delivery had a higher mortality rate. The strong association between mechanical ventilation and mortality in MAS was probably due to severity of meconium aspiration, along with severe birth asphyxia and complications associated with ventilation like ventilator associated pneumonia and air leaks.

Comparison studies showing outcome in MSAF.

Outcome	Ramakishore*et al*[18] (n=50)	Chandran *et al*[17] (n=301)	Present study.(n=152)
Discharged	44 (88%)	259 (86%)	138 (91%)
Death	06 (12%)	42(14%)	14 (9%)

In the present study, it was observed that the mortality rate was 9%. In Chandran *et al* study, the mortality rate was 14% and in the Ramakishore *et al* study, it was observed that the mortality rate was 12%. The variations in the mortality rate could be explained by the associated co-morbid conditions that were present along with MSAF.

CONCLUSION

It can be concluded that majority of babies with MSAF especially thin MSAF are asymptomatic and have a good outcome. Most of them improve with supplemental oxygen or CPAP and symptomatic treatment. Thick MSAF is associated with high chances of MAS. Majority of babies with severe MAS that require mechanical ventilation soon after birth have a poor outcome probably due to severe respiratory compromise and associated co-morbidities like severe birth asphyxia, sepsis and ventilator associated complications.

REFERENCES

1. T. E. Wiswell, J. M. Tuggle, and B. S. Turner, “Meconium aspiration syndrome: have we made a difference?” Pediatrics, vol. 85, no. 5, pp. 715–721, 1990.
2. G. M. Cleary and T. E. Wiswell, “Meconium-stained amniotic fluid and the meconium aspiration syndrome: an

update," Pediatric Clinics of North America, vol. 45, no. 3, pp. 511–529, 1998.
3. L. Nathan, K. J. Leveno, T. J. Carmody III, M. A. Kelly, and M. L. Sherman, "Meconium: a l990's perspective on an old obstetric hazard," Obstetrics and Gynecology, vol. 83, no. 3, pp. 329–332, 1994.
4. M. G. Ross, "Meconium aspiration syndrome—more than intrapartum meconium," The New England Journal of Medicine, vol. 353, no. 9, pp. 946–948, 2005.
5. E. M. Ostrea Jr. and M. Naqvi, "The influence of gestational age on the ability of the fetus to pass meconium in utero: clinical implications," Acta Obstetricia et GynecologicaScandinavica, vol. 61, no. 3, pp. 275–277, 1982.
6. R. H. Usher, M. E. Boyd, F. H. McLean, and M. S. Kramer, "Assessment of fetal risk in postdate pregnancies," American Journal of Obstetrics and Gynecology, vol. 158, no. 2, pp. 259–264, 1988.
7. G. M. Cleary and T. E. Wiswell, "Meconium-stained amniotic fluid and the meconium aspiration syndrome: an update," Pediatric Clinics of North America, vol. 45, no. 3, pp. 511–529, 1998.
8. P. A. Dargaville and B. Copnell, "The epidemiology of meconium aspiration syndrome: incidence, risk factors, therapies, and outcome," Pediatrics, vol. 117, no. 5, pp. 1712–1721, 2006.
9. S. Velaphi and D. Vidyasagar, "Intrapartum and post delivery management of infants born to mothers with meconium-stained amniotic fluid: evidence-based recommendations," Clinics in Perinatology, vol. 33, no. 1, pp. 29–42, 2006.
10. J. P. Goldsmith, "Continuous positive airway pressure and conventional mechanical ventilation in the treatment of meconium aspiration syndrome," Journal of Perinatology, vol. 28, supplement 3, pp. S49–S55, 2008.
11. T. E. Wiswell, C. M. Gannon, J. Jacob et al., "Delivery room management of the apparently vigorous meconium-stained neonate: results of the multicenter, international collaborative trial," Pediatrics, vol. 105, no. 1, pp. 1–7, 2000.
12. E. M. Bifano and A. Pfannenstiel, "Duration of hyperventilation and outcome in infants with persistent pulmonary hypertension," Pediatrics, vol. 81, no. 5, pp. 657–661, 1988.
13. J. R. Hageman, M. A. Adams, and T. H. Gardner, "Pulmonary complications of hyperventilation therapy for persistent pulmonary hypertension," Critical Care Medicine, vol. 13, no. 12, pp. 1013–1014, 1985.
14. J. P. Kinsella and S. H. Abman, "Efficacy of inhalational nitric oxide therapy in the clinical management of persistent pulmonary hypertension of the newborn," Chest, vol. 105, no. 3, pp. 92S–94S, 1994.
15. J. P. Kinsella, W. E. Truog, W. F. Walsh et al., "Randomized, multicenter trial of inhaled nitric oxide and high-frequency oscillatory ventilation in severe, persistent pulmonary hypertension of the newborn," Journal of Pediatrics, vol. 131, no. 1, part 1, pp. 55–62, 1997.
16. S. E. Chappell, M. R. Wolfson, and T. H. Shaffer, "A comparison of surfactant delivery with conventional mechanical ventilation and partial liquid ventilation in meconium aspiration injury," Respiratory Medicine, vol. 95, no. 7, pp. 612–617, 2001.
17. Chandran JR, Uma DN, Rajeshwary U. Risk factors for Meconiumaspiration and MAS (Meconium aspiration syndrome) in neonates bornthrough meconium stained amniotic fluid (MSAF) in a tertiary carecentre in Malabar (Kerala). Journal of Evolution of Medical and DentalSciences. 2013 Dec 9;2(49):9489-95.
18. AV R, KL S, GM. A study on meconium aspiration syndrome casesattending to Government general hospital, Anantapuramu, Andhrapradesh. International Journal of Research Health Sciences.2015; 3(1):169-173.

Source of Support: None Declared
Conflict of Interest: None Declared