



Etiological Factors, Clinical Profile and Outcome of Meconium Aspiration Syndrome in Newborn

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Introduction

The history of the word 'meconium' holds interest for all of us involved in perinatal care. Meconium is the dark greenish brown material excreted in utero, usually from a full term fetus. Fetal hypoxic distress causes neural stimulation of the mature gastrointestinal tract, which is caused by vagal stimulation from head or cord compression; resulting in peristalsis of the gut and relaxation of anal sphincter. Meconium- stained fluid consists of lanugo, mucus, intestinal epithelial cells, intestinal secretions (eg, bile) and is usually innocuous. Meconium has 3 main effects on infants, it

- Directly alters amniotic fluid by reducing its antibacterial activity, increasing the risk of perinatal bacterial infection, chiefly with *Escherichia coli*.
- It irritates fetal skin, causing an increased incidence of erythema toxicum.
- Causes MAS
- The aspiration of meconium causes hypoxia in the neonate by three mechanisms that produce ventilation perfusion mismatch:
 - Airway obstruction
 - Surfactant dysfunction

- Chemical pneumonia.

Aims and Objectives

- 1) To determine the incidence of meconium aspiration syndrome (MAS) among the babies born through meconium stained amniotic fluid (MSAF) in RMMCH
- 2) To evaluate etiological factors and severity of MAS
- 3) To assess the outcome of babies with meconium aspiration syndrome
- 4) To determine the maternal risk factors for MSAF

Review of Literature

Meconium aspiration syndrome is caused by presence of meconium in the tracheobronchial airways. The aspiration of meconium stained amniotic fluid by the fetus can happen during antepartum or intrapartum periods and can result in airway obstruction, interference with alveolar gas exchange, chemical pneumonia as well as surfactant dysfunction. These pulmonary effects cause gross ventilation perfusion mismatching. To complicate matter further, many infants with MAS have primary or secondary persistent pulmonary hypertension of the newborn as a result of chronic in utero thickening of the pulmonary vessels⁽¹⁾. Of

the 1332,884 eligible term newborns, the rate of meconium stained amniotic fluid (MSAF) was 7.93%. The prevalence of severe MAS was 0.067% in the overall population. MAS rate was 0.11% at 37-38 weeks of gestation (WG), 0.20% at 39-41 WG and 0.49% at 42-43 WG. The results confirmed the high prevalence of MSAF after 37 WG described by C.Fischer, C.Ferdynus⁽²⁾. Uzma Firdaus conducted study on clinical profile of babies and their mothers with meconium amniotic fluid at birth. All babies born with meconium stained amniotic fluid (MSAF) at Jawarhalal Nehru Medical college hospital, Aligarh Muslim university Aligarh from July 2010 to December 2010 were included in this study out of 172 babies with MSAF, 31 developed meconium aspiration syndrome (MAS) while 141 did not. For both these groups, the case records of the babies and their mothers were retrospectively studied and compared using univariate analysis and multiple regression analysis. The incidence of MSAF was 9.8% and of MAS was around 1.8%. The characteristics of the babies associated with increased risk of MAS were low apgar score at 5 minutes and presence of respiratory distress soon after birth. No significant maternal risk factor was identified. Cohort study was conducted by Salma Batool Naqvi⁽³⁾ to determine the association of meconium stained amniotic fluid with perinatal outcome in pregnant women of 37-42 weeks gestation and concluded that meconium stained amniotic fluid has an association with poor perinatal outcome and it is an indicator for negative fetal status. Results of the study were comparable to other international studies⁽³⁾. Factors independently associated with severe MAS identified by a case control study were thick meconium stained amniotic fluid, fetal tachycardia, Apgar score <3 at 1 minute and birth in a level III facility by C.Fischer, C.Feredynus⁽⁴⁾.

Pathophysiology

Physiological meconium passage. Fetal distress
 Meconium stained amniotic fluid
 Postpartum aspiration. Intrauterine gasping

Meconium aspiration
 Airway obstruction Cytokine induced
 surfactant
 Pneumonitis. Inactivation
 Pulmonary air trapping
 Atelectasis. Hypoxia. Decreased lung
 Ventilation perfusion. Compliance Mismatch
 Acidosis
 Persistent pulmonary hypertension

Materials and Methods

This study was conducted in the neonatology division of pediatrics in Rajah muthiah medical college hospital between November 2012 to October 2013.

Inclusion Criteria

Babies born through meconium stained amniotic fluid with

- 1) Gestational age more than 37 weeks
- 2) Post term babies
- 3) Both hospital born babies and referral new born babies at RMMCH will be included for the study.
- 4) Low birth weight babies (<2500g)

Exclusion Criteria

Preterm babies (<37 weeks of gestation)

All babies born with meconium stained amniotic fluid over a 1 year period were included in the study. Detailed history of all neonate was taken using a structured questionnaire and detailed examination was done for all neonates, gender, date of birth, time of birth, gestational age, and IP number were recorded. Gestational age was assessed by ballard scoring system. Maternal details regarding obstetric code, present pregnancy, gestational age in weeks, any antenatal risk factors labour. During labour or at delivery, the characteristics of amniotic fluid was identified as rupture of fetal membranes. If meconium was present, the quality of meconium was also identified as either thick or thin. Thick meconium was watery and thinly stained. Body staining / umbilical cord staining of meconium noted. Comparisons were made between meconium stained group and clear amniotic fluid group to

find out if any difference existed between the two groups in relation to mode of delivery and fetal outcomes. At delivery, all meconium exposed fetus, APGAR scores at the 1st and 10th minutes, secretions in the oropharynx, nasopharynx and trachea were aspirated, free flow oxygen and stomach wash given by the pediatrician with appropriate feeding tubes and DOWNE's score noted. Tracheal intubation and positive pressure ventilation and chest compression if required. This was followed by general physical examination from head to toe and systemic examinations were carried out. The diagnosis of meconium aspiration syndrome determined by the presence of respiratory distress, an abnormality on chest roentgenogram, arterial blood gas analysis were recorded. Postnatal respiratory complications pneumothorax, Pneumonia, persistent pulmonary hypertension and presence of asphyxia were also recorded. All babies were followed up for a period of 7 days following delivery.

Discussion

In this study we investigated the epidemiology of MAS in a level II newborn nursery for the entire population during the study period. We found that during the study period, the incidence of MAS was 51 per 103 live births.

The study was undertaken to evaluate the etiological factors, clinical profile and immediate outcome of 51 babies with meconium aspiration syndrome.

Out of 103 cases of MSAF, 51 cases were diagnosed to have MAS. Out of that 10 cases were diagnosed to have severe MAS, which constitute 19.6%

Sex ratio

1:1.25 male:female ratio showed as sex differentials in case of MAS.

MAS and other associated conditions

Meconium staining of amniotic fluid and subsequently leading to MAS was more commonly seen in associated with fetal distress due to various causes, PIH and post term pregnancies. Incidence of these factors in the

present study has been discussed with the correlation of other studies. PIH was found to be 23.50% in the present study. Similar study conducted by Devangi Desai ⁽⁵⁾ from April 2011 to march 2012 found that incidence of passage of meconium was relatively higher in patients with PIH (20%) and pregnancy beyond 40 weeks (14.66%). Amongst the cases 28.66% patient had an abnormal fetal heart pattern and 12% had a variable fetal heart pattern whereas in controls the values were 8%. The total number of patients with meconium aspiration was 18% whereas those with meconium aspiration syndrome were 6%.

Mode of delivery and MAS

In the present study, babies with MAS, born by LSCS formed the highest percentage (50.9%) followed by babies born by normal vaginal delivery (31.3%) and 9.8% by forceps delivery. These figures were almost in correlation with study done by Rekha kumara ⁽⁶⁾, Pushpha srichand ⁽⁷⁾, from June to November 2007 where the meconium stained amniotic fluid is a common occurrence during labor is associated with increased caesarian section rate and fetal morbidity and mortality. Similar comparison study conducted by S.Kumari, SN Gupta ⁽⁸⁾ from march 2006 to July 2006 found that normal delivery was significantly higher (58%) in clear liquor group as compared to MSAF group(22%). Cesarean section was more common in MSAF group (66%) where as it was (38%) in clear liquor group.

Incidence of MAS with thick and thin meconium:

In this study 39 (76.4%) babies with MAS had thick meconium and 12 babies (23.5%) had thin meconium.

Similarly, surekha tayede ⁽⁹⁾ found that neonatal complications were found in 36.36% of thick meconium group as compared to 14.28% of moderate meconium and none in thin meconium ⁽⁹⁾.

Asphyxia and MAS

In this study, 30% babies with MAS had Apgar 0-3, 43.3% with Apgar 4-6, 26.6% with MAS had 7-10. Similarly Espinheria. Mc et al ⁽¹⁰⁾, MST.Hosna

arakhutun ⁽¹¹⁾ found MAS occurrence was directly related to increasing severity of asphyxia.

Clinical Profile of Mas

It was observed that tachypnea was the consistent finding in most of the babies (60.7%) and chest retractions were seen in 43.1% of cases. When the severity of tachypnea was looked for, it was found that, almost every baby had respiratory distress at admission, i.e. 55% of cases had respiratory rate of 60-80 breaths/min and 45% cases had a rate of 80-100 breaths/min. Similarly in a study conducted by Ricki M Rajagukguk, M Sholeh Kosim ⁽¹²⁾ from January to June 2011, it was found that out of 48 subjects consisting of 26 males and 22 females, chest ray imaging showed normal in 33.3% of subjects, Pneumonia in 58.3% of subjects and meconium aspiration syndrome in 8.3% of subjects. Thick viscosity MSAF was significantly correlated to abnormal x ray imaging.

Similarly Surekha Tayade ⁽⁹⁾ found that fetal heart rate variations were more often in cases with thick meconium (86.36%) than with thin meconium (9.75%). Thick meconium group neonates had lower apgar scores as compared to moderate and thin meconium group. The umbilical cord blood pH was below 7.2 in 4 (11.4%) neonates of thin meconium, 15 (42.85%) in moderate meconium group and 30 (68.18%) in thick meconium group. Neonatal complications were found in 36.36% of thick meconium group as compared to 14.28% of moderate meconium and none in thin meconium ⁽⁹⁾.

Assessment of Respiratory Distress in MAS

In the present study among 103 babies, majority of them had respiratory distress, assessed by Downe's score of 6 at admission but subsequently developed progressive respiratory distress and 19 babies had maximum score of 8 and 12 babies developed acute respiratory failure and 12 babies were given ventilator support.

Respiratory Distress Scoring and Mortality

Out of 103 babies with MAS 10 had Downe's scoring more than 7. Downe's scoring at the first hour of delivery can enable to predict the outcome and severity of MAS. Babies with score >7 need support.

Mode of Treatment

In our study conservative line of management with oxygen, restricted fluids, and antibiotics was given for all 51 cases out of which 12 required ventilatory supports. Similarly study conducted by Ann S Bahiah ⁽¹³⁾, MB CHB John F Murphy ⁽¹³⁾ from 1st January 2008 to 30th June 2009 found that, 199 were primigravida out of 235 mothers delivered by caesarian section due to fetal distress of which 97 mothers were in labor. Seven of 186 neonates (3.6%) had a low apgar score (APGAR score < 7 at 5 minutes). Of these 7 neonates, one required intubation and was admitted to the neonatal intensive care unit ⁽¹³⁾.

Use of Prophylactic Antibiotics

In this study, antibiotics were given to all 51 babies with MAS. 6 babies died due to sepsis.

Complications of Mas

In the present study, PPHN was found to be the most common complications (3.90%) associated with MAS, other complications like PPHN and Pneumonia (1.9%) were also noted in the study. Out of 51 babies, 12 babies developed acute respiratory failure and were considered for ventilation. The median duration of ventilation was 3 days, with an interquartile ratio of 8-24 days. 6 babies developed septicaemia, with positive blood culture.

Mortality in Mas

In the present study, septicemia was the main cause of death in 60% of the cases, rest of the babies died were due to acute respiratory failure for which ventilator care was given but could not be survived. Out of 51 babies with MAS, 12 babies died.

Similarly study conducted by salma batool naqvi, summia manzoor⁽³⁾ from January 20, 2010 to July 20, 2010 found that meconium stained amniotic fluid has an association with poor perinatal outcome and it is an indicator for negative fetal status.

Mortality is reduced by intrapartum suctioning of oropharynx and a good pediatric intervention⁽³⁾.

Similar study conducted by erum majid sheik, sadaf mehmoos⁽¹⁴⁾ from April 2006 to march 2007 found that meconium stained amniotic fluid (MSAF) is associated with increased neonatal mortality and morbidity⁽¹⁴⁾.

Summary

The present study is a prospective observational study of 51 babies diagnosed to have meconium aspiration syndrome. They were evaluated for etiological factors, clinical profile and outcome. Out of these 10 cases were diagnosed to have severe mas which constitute 19.6%. The most common factors associated with mas were fetal distress, followed by PIH, PROM, postdatism and placental insufficiency. Caesarean section 50.9% was done in highest number of babies who developed mas compared to normal and forceps delivery. Incidence of mas was 51 per 103 live births. The mean birth weight of babies with mas was 2640gms +/- 240gms. Mas is known to cause severe respiratory distress and downes score ranging between 4-8, usually few hours after the onset of respiratory distress.

Nearly 30% of the cases with mas had birth asphyxia, out of which 26.6% had severe birth asphyxia. This indicate that passage of meconium can occur in utero, often considered a feature of stressed fetus. Undoubtedly aspiration had occurred before delivery in these babies. In such babies resuscitation at birth may not be much benefit and invariably leads to severe mas. More severe the asphyxia, higher are the chances of thick meconium stained amniotic fluid and greater the probability of mas.

Tachypnea was consistent finding in MAS and its severity was noted in almost all cases. PPHN was

the most common complication encountered followed by Pnemonia and septicemia. A total of 12 babies developed respiratory failure and were given ventilator support, and no one survived.

It is concluded that good intrapartum suctioning and neonatal management can reduce the complication of msaf to a great extent and the mortality rate in mas..

Conclusion

- 1) The incidence of meconium aspiration syndrome was 51 per 103 live births
- 2) The incidence of meconium aspiration syndrome is increased in cases of prolonged second stage of labour
- 3) MAS is more common in term 88.2% followed by post term babies
- 4) Mortality is increased in thick meconium 76.4%
- 5) Increasing incidence of birth asphyxia is directly related to increased incidence of mas
- 6) Occurrence of neonatal convulsion in cases of mas is due to severity of birth asphyxia
- 7) Use of antibiotics prevent the incidence of infection and septicemia in mas
- 8) Incidence of mas is reduced by oropharyngeal and if necessary laryngeal suction before the baby takes first breath
- 9) With regular antenatal check up the incidence of mas can be reduced.

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