

Clinical Profile of Meconium Aspiration Syndrome (MAS) in Relation To Gestational Age and Birth Weight and Their Immediate Outcome: An Observational Study

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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 forms one of the common causes of respiratory distress in newborn occurring worldwide and has mortality rate as high as up to 40% in the affected newborn. Aim of the study was to understand the factors causing meconium aspiration syndrome (MAS) in relation to gestational age and birth weight and their immediate outcome.

Methods: It was a prospective observational study carried out in Sadar Hospital, Motihari, and Bihar from January 2023 to December 2023. The study included the clinical profile of consecutive 115 cases of meconium aspiration syndrome admitted to the above center.

Results: Out of these 115 cases 86(74.78%) were male and 29(25.21%) were female. Fetal distress was predominant fetomaternal risk factors 59 babies (51.30%). Incidence of MAS was more in term babies (59.13%) and LBW babies (60.08%).

Conclusion: Prediction, early diagnosis and prompt treatment of newborn with MAS will decrease the chances of long term sequelae to achieve neurologically intact survival.

Keywords: Meconium Aspiration Syndrome (MAS), Respiratory Distress, Amniotic Fluid.

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Introduction

Meconium aspiration syndrome (MAS) remains one of the most common causes of neonatal respiratory distress.[1] The overall frequency of Meconium stained amniotic fluid (MSAF) varies between 5% to 25%. MAS occurs in 10% of newborns born through MSAF.

Also, newborns with MSAF are 100 times more likely to develop respiratory distress compared to counterparts born with clear amniotic fluid. And approximately 30% to 50% of infants with MAS have severe MAS, defined as the need for mechanical ventilation.

Meconium staining of amniotic fluid has been considered to be a predictor of poor fetal outcome because of the deleterious effect on neonatal lungs.[2] MSAF occurs with increasing frequency

along with increase in gestational age of the fetus, the incidence being as high as 30% in post term pregnancy.[3] Most babies with MSAF are 37 weeks or older.[4]

An increased incidence of MSAF is also due to hypoxia and infection, independent of fetal maturation. Meconium passage is a developmentally programmed postnatal event because 98% of healthy newborns pass meconium in the first 24 to 48 hours after birth.[5]

Treatment of MAS is a challenge to neonatologists. Appropriate use of positive end expiratory pressure, surfactant therapy, recent advances like high frequency ventilation and inhaled nitric oxide have led to reduced incidence of adverse outcome and improved survival rate of newborns with MAS.

Various studies have described the various attributes and morbidity pattern of MAS.[6] This study was undertaken to compare and assess the mortality and morbidity patterns associated with MAS in both intramural and extramural babies.

Material and Methods

The study design was a prospective observational study carried out in inborn babies of Sadar Hospital, Motihari, and Bihar from January 2023 to December 2023. The study included the clinical profile of consecutive 115 cases of meconium aspiration syndrome admitted to the Sadar Hospital, Motihari, and Bihar.

Admitted patients with presence of meconium-stained amniotic fluid, Tachypnoea, retractions, grunting or other abnormal signs on physical examination consistent with pulmonary disease, need for supplemental oxygen or ventilator support and compatible chest radiograph were included in this study.

Patients with transient tachypnoea of newborn (TTNB), hyaline membrane disease (HMD), congenital pneumonia and sepsis, other air leak syndromes, meconium stained amniotic fluid but without respiratory distress and babies born through meconium stained amniotic fluid with normal chest X – ray were excluded in this study.

All preterm, term and post term infants (appropriate for gestational age and birth weight) delivered normally or by caesarean section or forceps, fulfilling all the criteria for MAS who were admitted to NICU, during the above mentioned period were included in the study. A detailed antenatal history also elicited to find out the etiology of passage of meconium into amniotic

fluid. Detailed natal history was taken to find out the type of delivery and indications for any interventions or drugs used for delivery were obtained.

In all meconium stained infants APGAR score at 1 minute and 5 minute assessed and birth weight, gestational age (by New Ballard scoring) and respiratory distress (by Downe's score) noted. During delivery, the type of delivery and any complications in mother were recorded and resuscitative measure was done at birth.

All infants with the diagnosis of meconium aspiration were admitted and treated in NICU with oxygen, restricted intravenous fluids, antibiotics; ionotropic support and ventilator support as and when indicated.

In all cases of MAS, routine investigations like complete blood counts (CBC), sepsis screen, CRP and blood culture were done when indicated. Radiological assessment was done with serial x-rays as demanded by the condition. Other investigations like blood glucose, serum electrolytes and arterial blood gases (ABG) were done and interpreted when mandated.

Results

Out of these 115 cases 86(74.78%) were male and 29(25.21%) were female. The fetomaternal factors associated with MAS were fetal distress in 59 (51.30%), PIH in 25(21.73%), PROM in 14(12.17%), oligohydramnios in 12(10.43%), anemia in 5(4.34%). It was observed that MAS developed in 10(8.69%) preterm babies, 68 (59.13%) term and 37(32.17%) post term babies (table 1). The gestational age wise distribution is shown in table 2.

Table 1: Distribution of MAS as per gestational maturity

Gestational maturity	No. of cases	Percentage
Preterm	10	8.69%
Term	68	59.13%
Post term	37	32.17%

Table 2: MAS with gestational age

Gestational age (in weeks)	No. of cases	Percentage
<34	0	0
34-36	10	8.69%
36-38	13	11.30%
38-40	24	20.86%
40-42	31	26.95%
>42	37	32.17%

The incidence of MAS was more in the low birth weight babies.

It was observed that 76 babies had birth weight of less than 2.5kgs (66.08%) (Table 3). The APGAR score assessed at 1 minute was < 4 in 27 (23.47%),

4 to 7 in 6(5.21%) and >7 in 82 (71.30%) (Table 4). The various complications that the newborn had with MAS were pneumonia in 4, pulmonary haemorrhage in 4, septicaemia in 20, acute respiratory failure in 24, birth asphyxia in 33,

pneumothorax in 10, PPHN in 5. No complication was seen in 5 newborn only (table 5).

Table 3: Birth weight and MAS

Birth weight (in kgs)	No. of cases	Percentage
<2.5	76	66.08%
2.5-3.5	24	20.86%
>3.5	15	13.04%

Table 4: MAS and APGAR score at 1 minute

APGAR score at 1 minute	No. of cases	Percentage
<4	27	23.47%
4 to 7	6	5.21%
>7	82	71.30%

Table 5: Complications associated meconium aspiration syndrome

Complications	No. of cases	Percentage
Pneumonia	4	3.47%
Pulmonary hemorrhage	4	3.47%
Septicemia	20	17.39%
Acute respiratory failure	24	20.86%
Birth asphyxia	33	28.65%
Pneumothorax	10	8.69%
PPHN	5	4.34%
No complications	5	4.34%

The mode of treatment received was conservative in 80(69.56%) and ventilator support in 42(36.78%). Of the 115 newborn with MAS, 33(28.69%) died and 82(71.30%) were discharged. The various causes of mortality in MAS is shown in table 6.

Table 6: Mortality in MAS

Complications	No. of cases	Percentage
Isolated Birth asphyxia (HIE III)	12	36.36%
Isolated ARF	4	12.12%
Birth asphyxia+ Septicemia + Acute Respiratory Failure	3	9.09%
Septicemia + ARF + Pulmonary Hemorrhage	3	9.09%
Acute Respiratory Failure + Pneumothorax	9	27.27%
Pneumothorax + Pulmonary Hemorrhage	2	6.06%

Discussion

Meconium staining of amniotic fluid, leading to MAS was more commonly seen with associated fetal distress due to various causes, PIH and post term pregnancies. A prospective study conducted by Coughtrey H et al reported that fetal distress is common in infants who develop respiratory distress after MSAF.[7] PIH was found in 23.58% cases in a study by Miller et al and 11.20% by Fujikura.[8,9]

In the present study it was 21.80%. Incidence of PROM was found in 6.60% cases by Miller et al, and in present study it was 21.80%. Trimmer et al noted passage in 38% cases of postdated pregnancy with oligohydramnios. The study by Hofmeyer GJ et al, it was found that the presence of thick meconium staining of amniotic fluid is an indication of oligohydramnios, because meconium passed into the normal volume of amniotic fluid usually appear thin.[10] In the present study 10.34% cases were associated with

oligohydramnios. In the present study; babies with MAS born by LSCS formed the highest percentage (n=46, 40.00%) followed by babies born by normal vaginal delivery (n=40, 34.78%) and

(n=19, 16.09%) by forceps delivery, 08.69% by vacuum extraction. These figures are almost in correlation with figures of other authors. Narang et al found 54.22% babies were born by LSCS and 30.7% were delivered by normal vaginal delivery and 11.8% by forceps delivery.[11]

In the present study the mean gestational age was found to be 38-40 weeks. Erkkola et al, found that 95% of cases were > 36 weeks gestation in their study.[12] Green and Paul say that prevalence of MAS increases to 10% or more after 38 weeks.[13] In a study by Eiden et al they found the frequency of meconium stained amniotic fluid increased with increasing gestational age of fetus i.e., 7% before 38 weeks; 78% between 38-42 weeks and 35% or more in pregnancies lasting longer than 42 weeks.[14] In a study by Suresh GK et al; the mean

gestational age was 38.41 ± 2.31 weeks in babies born with meconium stained liquor and 37.80 ± 2.27 weeks in babies born with meconium stained liquor.[15] In the present study, the mean birth weight was 2.95kg ranging from 1.8 to 4.1 kg. Majority of the MAS cases had birth weight < 2.5 kg (66.08%). According to study by Pravid Goud and Usha Krishna, majority of babies in their study weighed 2.5-3kg, and 4.2% babies weighed > 3.5 kgs.[16] In National Neonatal Perinatal Database of India 2002-2003, the mean birth weight of babies born through MSAF was 2646 ± 552 gm. In a study by Suresh GK et al, the mean birth weight was 2685 ± 536 gm in thick meconium stained liquor babies and 2669 ± 637 gm in thin meconium stained liquor babies.[15] In one study on 100 term LBW babies whose birth weights were < 10 th percentile of gestational age, conducted in 2015 by NK Arora, VK Paul, and Meharban

Singh in the neonatal section, Department of Pediatrics, AIIMS, New Delhi, it was found that twenty-four infants with IUGR passed meconium utero, of which four also manifested with clinical evidence of the meconium aspiration syndrome.[17]

In the present study, APGAR score recorded at 1 minute < 7 was found in total in 33(35.63%) cases with birth asphyxia ; 71.30% ($n=82$) of cases had APGAR score more than 7 at 1 minute. Abramovici et al found that APGAR at 1 minute was < 7 only in 7.5% of cases and Miller FC et al found that Apgar at 1 minute was < 7 in 25.40% of cases, while in another study by Espinheira et al found APGAR score of < 7 in as high as 69% of cases.[18,19,20]

Incidence of Birth asphyxia in MAS could be having wide variation depending on during presence of other feto-maternal risk factors or comorbidities as well as with pattern of follow up antenatal period and also on parity, as failure to progress is a common association in primigravida. Present study is comparable to the study conducted by Miller FC et al.[19]

In the present study 55 (63.21%) cases were treated conservatively whereas 32(36.78%) cases needed ventilator support. In a study by Wiswell TE et al, it was found that of the neonates with MAS, 29.7% required mechanical ventilation.[21]

In the present study, birth asphyxia was the main cause of death in 40.90% cases, followed by ARF with pneumothorax in 27.27% cases, then by acute respiratory failure with birth asphyxia with pulmonary hemorrhage and ARF with birth asphyxia and septicemia.

Narang et al (1993) found that 53.8% cases of MAS had birth asphyxia and 15.8% had air leak and 3.8% had PPHN. Wiswell et al (1990), found

that majority of babies with MAS died from acute respiratory failure, PPHN and air leaks but some will die from associated neurological or renal sequelae of birth asphyxia. The mortality rate of MAS is more difficult to assess since the quoted figures vary widely. [11,21]

Conclusion

MAS is an entity which is commonly seen in term and post term babies. There is a significant correlation between the birth weight and outcome in MAS. When thick meconium stained liquor is noted prior to birth, anticipation is necessary and non-vigorous babies need aggressive management and possibly early ventilation. Asphyxiated babies should be followed up astutely. Continuous monitoring and early intervention, followed by due resuscitation as per guidelines can reduce the morbidity, complications and the mortality in MAS.

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