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Original Research Article

A Study of the Clinical Characteristics of Meconium Aspiration Syndrome in Relation to Gestational Age and Birth Weight, as well as the Immediate Result in NSCB Medical College Jabalpur Madhya Pradesh

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Abstract

Background: Meconium aspiration syndrome (MAS) is described as respiratory distress in a newborn born via meconium-stained amniotic fluid (MSAF) with typical radiological abnormalities and symptoms that cannot be explained otherwise. It is one of the most prevalent causes of infant respiratory distress globally, with a death rate of up to 40% in afflicted newborns.

Objectives: To examine the clinical profile of meconium aspiration syndrome (MAS) in neonates in relation to gestational age and birth weight, as well as their immediate outcome, and to identify feto-maternal risk factors for MAS that, if identified early, could improve long-term fetal outcome and ensure neurologically intact survival.

Methods: A prospective observational study was conducted on 115 newborn cases of meconium aspiration syndrome who were admitted to the above center. All preterm, term, and post-term infants (suitable for gestational age and birth weight) born routinely or by cesarean section or forceps who met all of the MAS criteria and were admitted to the NICU within the above-mentioned time period were included in this study.

Results: Out of 1130 babies born through meconium-stained amniotic fluid, 729 cases with respiratory distress were admitted to NICU during this period of time, and MAS was noted in 110 babies (15.09%). There were 83 (75.45%) males and 27 (24.54% females) among the 110 cases. MAS was more common in term newborns (59.09%). Birth asphyxia was the most prevalent consequence related to MAS (29.09%). Babies died at a rate of 27.27%, with ARF+ Pneumothorax being the most common reason.

Conclusion: Prediction, early identification, and timely treatment of newborns with MAS reduces the likelihood of long-term consequences and neurologically intact survival.

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

Introduction

One of the most common causes of infant respiratory distress is meconium aspiration syndrome.[1] MSAF occurs at a rate ranging from 5% to 25% of the time. Meconium aspiration syndrome affects 5% of children delivered via MSAF. Infants born with MSAF are 100 times more likely to have respiratory distress than their counterparts born with clear amniotic fluid.

Meconium staining of amniotic fluid has been regarded as a predictor of poor fetal fate due to its direct association with fetal distress and a higher probability of meconium inhalation, which has a negative effect on neonatal lungs.[2] Meconium-stained amniotic fluid is found in 9% to 22% of live births, with the frequency increasing with the fetus' gestational age.[3]

Meconium passage in utero occurs uncommonly before 32 weeks of gestation, and most newborns with meconium-stained amniotic fluid are 37 weeks or older.[4] MSAF prevalence rises with gestational age, reaching as high as 30% in post-term pregnancy. Independent of fetal maturation, there is an increase in the incidence of MSAF in the presence of feto-maternal stress factors such as hypoxia and infection.

Meconium passing is a developmental, postnatal event since 98% of healthy newborns pass meconium during the first 24 to 48 hours after birth. MSAF is detected in fetuses at or after 37 weeks of gestation in greater than 98% of cases.[5] MSAF is more common in post-term pregnancies and relatively uncommon in preterm deliveries.[4] MAS is still a difficult condition for neonatologists to manage.

Avoiding postpartum pregnancies and enhancing intrapartum surveillance is also advantageous. Recent advances in the understanding and management of acute lung injury, such as the appropriate use of positive end-expiratory airway pressure, surfactant therapy, high-frequency ventilation, and the use of inhaled nitric oxide, have resulted in a lower incidence of adverse outcomes and an improved survival rate of infants with MAS.

The current study aimed to examine the clinical profile of meconium aspiration syndrome (MAS) in newborns in relation to birth weight and gestational age, as well as their immediate outcome.

Materials and Methods

A prospective observational study was performed at NSCB Medical College Jabalpur MP on 110 patients of meconium aspiration syndrome admitted to the above center for a total duration of one year from 01 January 2020 to 30 December 2020.

All preterm, term, and post-term infants (suitable for gestational age and birth weight) born routinely or by cesarean section or forceps who met all of the MAS criteria and were admitted to the NICU within the above-mentioned time period, patients showing the 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 had a compatible chest radiography were included in the study.

However, patients with Transient tachypnoea of the newborn (TTNB), hyaline membrane disease (HMD), Congenital pneumonia and sepsis, Other air leak syndromes, Newborns with meconium-stained amniotic fluid but without respiratory distress, and Babies born through meconium stained amniotic fluid with normal chest X–ray were excluded in the study.

A detailed prenatal history was also obtained to determine the etiology of meconium entry into the amniotic fluid. A detailed natal history was acquired to determine the kind of delivery, as well as

indications for any interventions or medicines used during delivery. All meconium-stained infants had their APGAR scores checked at 1 minute and 5 minutes, as well as their birth weight, gestational age (as determined by New Ballard scoring), and respiratory distress (as determined by Downe's score). The type of delivery and any difficulties in the mother were noted during delivery, and resuscitation measures were taken upon birth.

All infants with meconium aspiration were admitted to the NICU and treated with oxygen, restricted IV fluids, antibiotics, ionotropic support, and ventilator support if needed. Routine investigations such as complete blood counts (CBC), sepsis screen, CRP, and blood culture were performed in all MAS cases where indicated. The condition required serial X-rays for radiological evaluation. Other tests, such as blood glucose, serum electrolytes, and arterial blood gases (ABG), were performed and interpreted as needed.

Results

Out of 1130 babies born through meconium-stained amniotic fluid, 729 cases had respiratory distress. Out of 729 cases with respiratory distress admitted to NICU during this period of time, MAS was noted in 110 babies (15.09%). Males outnumbered females by 83 (75.45%) to 27 (24.54%).

MAS was seen in 9 (8.18%) preterm babies, 65 (59.09%) term babies, and 36 (32.72%) post-term babies (Table 1).

Table 1: Distribution of MAS as per gestational maturity

Gestational maturity	Number of cases	Percentage
Preterm	9	8.18
Term	65	59.09
Post-term	36	32.72

The data is expressed as numbers and percentage

Table 2: MAS with gestational age

Gestational age (weeks)	Number of cases	Percentage
<34	0	0
34-36	9	8.18
36-38	12	10.90
38-40	24	21.81
40-42	30	27.27
> 42	35	31.81

The data is expressed as numbers and percentage

Table 2 depicts the gestational age distribution. The prevalence of MAS was higher in low birth weight neonates. Table 3 shows that 75 newborns (68.18%) had birth weights of less than 2.5kg.

Table 3: Birth weight and MAS

Birth weight (in kgs)	Number of cases	Percentage
<2.5	75	68.18
2.5-3.5	22	20
>3.5	13	11.81

The data is expressed as numbers and percentage

The APGAR score assessed at 1 minute was< 4 in 25 (22.72), 4 to 7 in 5 (4.54%) and >7 in 80 (72.71%) (Table 4).

Table 4: MAS and APGAR score at 1 minute

APGAR score at 1 minute	Number of cases	Percentage
<4	25	22.72
4-7	5	4.54
>7	80	72.72

The data is expressed as numbers and percentage

The newborn developed pneumonia three times, pulmonary hemorrhage three times, septicemia 21 times, acute respiratory failure 25 times, birth asphyxia 32 times, pneumothorax nine times, and PPHN seven times. Only 5 newborns had complications (Table 5).

Table 5: Complications associated with meconium aspiration syndrome

Complications	Number of cases	Percentage
Pneumonia	3	2.72
Pulmonary hemorrhage	3	2.72
Septicemia	21	19.09
Acute respiratory failure (ARF)	25	22.72
Birth asphyxia	32	29.09
Pneumothorax	9	8.18
PPHN	7	6.36
No complications	5	4.54

The data is expressed as numbers and percentage

Of the 115 newborns with MAS, 30 (27.27%) died, and 80 (72.72%) were discharged. The various causes of mortality in MAS are shown in table 6.

Table 6: Mortality in MAS

Complications	Number of cases	Percentage
Isolated Birth asphyxia (HIE III)	3	2.72
Isolated ARF	3	2.72
Birth asphyxia + Septicemia+ Acute Respiratory Failure	21	19.09
Septicemia+ ARF+ Pulmonary Hemorrhage	25	22.72
Acute Respiratory Failure +Pneumothorax	32	29.09
Pneumothorax + Pulmonary Hemorrhage	9	8.18

The data is expressed as numbers and percentage

Discussion

Our study reported that the maximum number of MAS cases were seen in term stage (59.09%) followed by post-term (32.72%) and preterm (8.18%). Moreover, the current study indicated that the average gestational age was 38-40 weeks. In their investigation, Erkkola et al. [6] discovered that 95% of cases were more than 36 weeks gestation. Green and Paul[7] discovered that the prevalence of MAS rises to 10% or higher at 38 weeks. Eiden et al. [8] discovered that the frequency of meconium-colored amniotic fluid rose with increasing gestational age of the fetus, 7% before 38 weeks, 78% between 38-42 weeks, and 35% or more in pregnancies lasting longer than 42 weeks. According to Suresh GK et al. [9], the mean gestational age of babies born with meconium-stained liquor was 38.41±2.31weeks and 37.80±2.27 weeks for babies born without meconium-stained liquor.

The mean birth weight in the current study was 2.96kg, with a range of 1.9 to 4.0 kg. The majority of MAS cases were born weighing less than 2.5 kg. According to a study conducted by Pravid Goud and Usha

Krishna[10], the majority of newborns in their study weighed 2.5-3kg, with 4.2% weighing more than 3.5 kg. The mean birth weight of babies born using MSAF was 2646±552 gm, according to the National Neonatal Perinatal Database of India 2002-2003. Suresh GK et al. [10] found that the mean birth weight of thick meconium-stained liquor newborns was 2685±536gm and 2669±637gm in thin meconium-stained liquor babies.

In the current study, an APGAR score of 7 was found in 30 (27.27%) of the cases with birth asphyxia, while 80 (72.72%) of the cases had an APGAR score greater than 7. Abramovici et al. [12] discovered that APGAR at 1 minute was 7 in just 7.5% of patients, and Miller FC et al. [13] discovered that Apgar at 1 minute was 7 in 25.40% of cases, whereas Espinheira et al. [14] discovered an APGAR score of 7 in as much as 69% of cases.

In the present study, birth asphyxia was the main cause of death in 29.09% of cases, followed by ARF (22.72%) and others. Narang et al. [15] found that 53.8% of cases of MAS had birth asphyxia and 15.8% had air leaks, and 3.8% had PPHN. Our findings showed that maximum mortality among newborn patients was due to Acute Respiratory Failure +Pneumothorax (29.09%). Wiswell et al. [16] found that the 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.

Conclusion

One of the most prevalent causes of baby respiratory distress is meconium aspiration syndrome (MAS). Meconium aspiration was linked to the following factors: a) higher gestational age (greater in term and post-term babies), b) birth weight larger than 2.5 kgs, and c) Caesarean delivery. MAS has a high morbidity and mortality rate. Thick meconium below the vocal cords and a low APGAR score at 1 minute were related to the highest death rate. In the current study, death occurred in 30 patients (27.27%). As a result, early detection and treatment of meconium aspiration syndrome can reduce mortality and morbidity.

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