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RESEARCH ARTICLE

A study on clinical profile of meconium aspiration syndrome in relation to gestational age and birth weight and their immediate outcome

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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. **Objectives:** To review the clinical profile of meconium aspiration syndrome (MAS) in neonates in relation to gestational age and birth weight and their immediate outcome. Also to identify feto-maternal risk factors of MAS, early identification of which could improve long term fetal outcome to ensure neurologically intact survival. **Methods:** It was a prospective observational study carried out in NICU, Gauhati Medical College & Hospital, Guwahati, Assam. The study included the clinical profile of consecutive 115 cases of meconium aspiration syndrome admitted to the above center during period of one year starting from 1st of July 2019 to June 30, 2020. **Results:** Out of 1129 babies born through meconium stained amniotic fluid, 731 cases with respiratory distress were admitted to NICU during this period of time and MAS noted in 115 babies (15.73%). Out of these 115 cases 86(74.78%) were male & 29(25.21%) were female. Fetal distress was predominant feto-maternal 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.

Meconium aspiration syndrome (MAS) is one of the leading causes of respiratory distress in newborn all over the world. MAS is frequently associated with fetal hypoxia which promotes meconium discharge in amniotic fluid and aspiration of MSAF. Meconium passage is rare in preterm. After 37 weeks its incidence increases steadily with increasing gestational age.[2] The condition has the unique combination of airflow obstruction, atelactasis, lung inflammation, and high risk of coexistent pulmonary hypertension.[3] Timely diagnosis and intervention can decrease the morbidity and mortality and achieve neurologically intact survival.

Methods

The study design was a prospective observational study carried out in inborn babies of Neonatal Intensive Care Unit (NICU), Gauhati Medical College & Hospital, Guwahati, Assam. The study included the clinical profile of consecutive 115 cases of meconium aspiration syndrome admitted to the above centre during period of one year starting from 1st of July 2019 to 30th June 2020.

Inclusion criteria:

1) Presence of meconium-stained amniotic fluid.
2) Tachypnoea, retractions, grunting or other abnormal signs on physical examination consistent with pulmonary disease.
3) Need for supplemental oxygen or ventilator support.
4) A compatible chest radiograph.

Exclusion criteria:

1) Transient tachypnoea of newborn (TTNB)
2) Hyaline membrane disease (HMD)

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3) Congenital pneumonia and sepsis
4) Other air leak syndromes
5) Newborn with meconium stained amniotic fluid but without respiratory distress.
6) Babies born through meconium stained amniotic fluid with normal chest X - ray.

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 1129 babies born through meconium stained amniotic fluid, 731 cases had respiratory distress. Out of 731 cases with respiratory distress admitted to NICU during this period of time, MAS was noted in 115 babies (15.73%). Males were 86 (74.78%) and females were 29 (25.21%). 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. 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 1: Distribution of MAS as per gestational maturity

Gestational maturity	Number	Percentage
Preterm	10	8.69%
Term	68	59.13%
Post term	37	32.17%

Table 2: MAS with gestational age

Gestational age (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%

Table 3: Birth weight and MAS

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

Table 4: MAS and APGAR score at 1 minute

APGAR score at 1 minute	Number of cases	Percentage
<4	27	23.47%
4 to 7	6	5.21%
> 7	82	71.30%

Table 5: Complications associated with 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

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%

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.

Discussion

The present study was undertaken to study the clinical profile of 115 babies with meconium aspiration syndrome in relation to their birth weight and gestational age and their immediate outcome. Out of 1129 cases of MSAF babies, 731 cases had respiratory distress and were admitted to NICU, of which 115 cases (15.73%) were diagnosed to have MAS.

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 [4] et al reported that fetal distress is common in infants who develop respiratory distress after MSAF. PIH was found in 23.58% cases in a study by Miller [5] et al, and 11.20% by Fujikura [6]. In the present study it was 21.80%. Incidence of PROM was found in 06.60% 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 [7] 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. 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 [8] 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.

In the present study the mean gestational age was found to be 38-40 weeks. Erkkola [9] et al, found that 95% of cases were > 36 weeks gestation in their study. Green and Paul [10] say that prevalence of MAS increases to 10% or more after 38 weeks. In a study by Eiden et al [11] 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. In a study by Suresh GK et al [12]; 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.

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 <2.5kg (66.08%). According to study by Pravid Goud and Usha Krishna [13], majority of babies in their study weighed 2.5-3kg , and 4.2% babies weighed >3.5 kgs. 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 [12] 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. In one study on 100 term LBW babies whose birth weights were <10th percentile of gestational age, conducted in 2015 by NK Arora, VK Paul, and Meharban Singh [14] 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.

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 [15] et al found that APGAR at 1 minute was <7 only in 7.5% of cases and Miller FC et al[16] found that Apgar at 1 minute was <7 in 25.40% of cases, while in another study by Espinheira et al [17] found APGAR score of <7 in as high as 69% of cases. Incidence of Birth asphyxia in MAS could be having wide variation depending on during presence of other feto-maternal risk factors or co-morbidities 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 [16].

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 [18] et al, it was found that of the neonates with MAS, 29.7% required mechanical ventilation.

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 [8] 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 [18] (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 sequalae of birth

asphyxia. The mortality rate of MAS is more difficult to assess since the quoted figures vary widely.

Conclusion

Meconium aspiration syndrome (MAS) remains as one of the common causes of respiratory distress in the newborn. Increased incidence of meconium aspiration was associated with - a) Increase in the gestational age (more in term and post term babies), b) Birth weight>2.5 kgs and c) Caesarean delivery. MAS carries a high morbidity and mortality. Highest mortality was associated with thick meconium when it was present below the vocal cords and low APGAR score at 1 minute. In the present study, mortality occurred in 33(28.69 %) cases. Hence, proper diagnosis and timely intervention can reduce mortality and morbidity in meconium aspiration syndrome.

Conflict of interest: None. **Disclaimer:** Nil.

References

1. Fischer C, Rybakowski C, Ferdynus C, Sagot P, Gouyon JB. A population based study of meconium aspiration syndrome in neonates born between 37and 43 weeks of gestation. International journal of pediatrics. 2012 Jan1; 2012.
2. Singh G, Singh O, Thapar K. Neonatal outcome in meconium stained amniotic fluid: A hospital based study. Int J Contemp Pediatr. 2017 Mar; 4(2): 356-60.
3. Ramakishore AV, Subramanyam KL, Mahesh G. A study on meconium aspiration syndrome cases attending to Government general hospital, Anantapuramu, Andhra Pradesh. Int J Res Health Sci. 2015; 3(1): 169-73.
4. Coughtrey H, Jeffery HE, Henderson-Smart DJ, Storey B, Poulos V. Possible causes linking asphyxia, thick meconium and respiratory distress. Australian and New Zealand journal of obstetrics and gynaecology. 1991 May; 31(2): 97-102.
5. Miller FC, Sacks DA, Yeh SY, Paul RH, Schifrin BS, Martin Jr CB, et al. Significance of meconium during labor. American journal of obstetric and gynecology. 1975 Jul 1; 122(5): 573-80.
6. Fujikura T, Klionsky B. The significance of meconium staining. American journal of obstetrics and gynecology. 1975 Jan 1; 121(1): 45-50
7. Hofmeyr GJ, Xu H, Eke AC. Amnioinfusion for meconium-stained liquor in labour. Cochrane Database of Systematic Reviews. 2014; 2014(1): CD000014.
8. Narang A, Nair PM, Bhakoo ON, Vashisht K. Management of meconium stained amniotic fluid: A team approach. Indian pediatrics. 1993 Jan; 30: 9.
9. Erkkola R, Kero P, Suhonen-Polvi H, Korvenranta H. Meconium aspiration syndrome. In Annaleschirurgiae et gynaecologiae. Supplementum 1994; 208: 106-9.
10. Green JN, Paul RH. The value of amniocentesis in prolonged pregnancy. Obstetrics and gynecology. 1978 Mar; 51(3): 293-8.
11. Eden RD, Seifert LS, Winegar A, Spellacy WN. Perinatal characteristics of uncomplicated postdate pregnancies. Obstetrics and gynecology. 1987 Mar; 69(3 Pt 1): 296-9.
12. Suresh GK, Sarkar S. Delivery room management of infants born through thin meconium stained liquor. Indian Pediatr. 1994 Oct 1; 31(10): 1177-81.
13. Goud P, Krishna U. Significance of meconium staining of amniotic fluid in labour. Journal of Obstetrics and Gynaecology of India. 1989; 39: 523-6.

14. Arora NK, Paul VK, Singh M. Morbidity and mortality in term infants with intrauterine growth retardation. Journal of tropical pediatrics. 1987 Aug 1; 33(4):186-9.
15. Abramovici H, Brandus JM, Fuchs K, Timor-Tritsch I. Meconium during delivery: a sign of compensated fetal distress. American journal of obstetrics and gynecology. 1974 Jan 15; 118(2): 251-5.
16. Miller FC, Lead JA. Intrapartum assessment of the postdate fetus. American journal of obstetrics and gynecology. 1981 Jan 1; 141(6): 516-20.
17. Espinheira MC, Grilo M, Rocha G, Guedes B, Guimaraes H. Meconium aspiration syndrome-the experience of a tertiary center. Revista Portuguesa de Pneumologia (English Edition). 2011 Mar 1;17(2):71-6.
18. Wiswell TE, Tuggle JM, Turner BS. Meconium aspiration syndrome: have we made a difference? Pediatrics. 1990 May; 85(5): 715-21.

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