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A STUDY ON CLINICAL PROFILE OF NEWBORN WITH MECONIUM ASPIRATION SYNDROME IN RELATION TO GESTATIONAL AGE AND BIRTH WEIGHT AND THEIR IMMEDIATE OUTCOME

Paediatrics

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ABSTRACT

Background: Meconium aspiration syndrome (MAS) remains one of the most common causes of neonatal respiratory distress. It in 5% of infants born through Meconium staining of amniotic fluid (MSAF). Infants born through MSAF are 100 times more likely to develop respiratory distress. MSAF has been considered to be a predictor of poor fetal outcome because of its direct correlation to fetal distress and increased likelihood of inhalation of meconium with resultant deleterious effect on neonatal lungs. **Objectives:** The present study was undertaken to review the clinical profile of meconium aspiration syndrome (MAS) in neonates in relation to birth weight and gestational age and their immediate outcome. **Material And Methods:** This prospective observational study was carried out on neonates admitted in NICU of Tertiary care hospital. Total 66 Babies born with gestational age > 32 weeks with meconium-stained skin or meconium-stained umbilical cord or presence of meconium in the trachea at birth. A detailed antenatal, natal and postnatal history was obtained. During delivery, the type of delivery and any complications in the mother were recorded. APGAR score at 1 minute and 5 minute was assessed and gestational age assessment was done with Ballard's score. A detailed clinical examination was carried out and respiratory distress was monitored using Downes score system. If the score > 6 it was an indication for ventilation. **Results:** During the study period, out of 3120 deliveries, 632 (20.24%) babies had meconium-stained liquor & 66 had MAS (10.44%). Fetal distress was found to be the commonest (51.52%) factor associated with MAS followed by PIH 21.21%), oligohydramnios (12.12%) and PROM (6.06%). Caesarean section birth were commonest (40.91%) of cases followed by babies born by normal vaginal delivery (34.85%). Majority of MAS occurred in term babies with mean gestational age of 38-40 weeks (50%). Mean birth weight of babies with MAS was 2.68 kg (1.7- 4 kgs). 30.30% cases had severe asphyxia and 57.58% cases had mild to moderate asphyxia. Most common complication was birth asphyxia (37.88%), ARF in 19.70% cases. Septicaemia in 18.18 cases. Severe birth asphyxia was found to be the main cause of death in majority of cases followed by acute respiratory failure. Mortality occurred in 18 cases (27.27%). 20 cases (30.30%) needed ventilator support, 18 babies died and 2 baby survived and was discharged. **Conclusion:** MAS is one of the common causes of respiratory- distress in the new-born. MAS carries a high morbidity and mortality. High mortality was associated with high Downe's and low APGAR score at 1 minute. Hence proper diagnosis and timely intervention can reduce the mortality and mortality meconium aspiration syndrome.

KEYWORDS

Meconium staining of amniotic fluid, Meconium aspiration syndrome, Respiratory Distress, Downe's score, APGAR score, Mechanical Ventilation

INTRODUCTION:

Meconium aspiration syndrome remains one of the most common causes of neonatal respiratory distress[1]. The overall frequency of MSAF varies between 5% to 25%. Meconium aspiration syndrome occurs in 5% of infants born through MSAF. Infants born through MSAF are 100 times more likely to develop respiratory distress compared to the counter parts born through clear amniotic fluid.

Meconium staining of amniotic fluid has been considered to be a predictor of poor fetal outcome because of its direct correlation to fetal distress and increased likelihood of inhalation of meconium with resultant deleterious effect on neonatal lungs[2]. Meconium-stained amniotic fluid occurs in 9% to 22% of live births with increasing frequency along with increase in gestational age of fetus[3]. In utero, meconium passage rarely occurs before 32 weeks of gestation and most babies with meconium-stained amniotic fluid are 37 weeks or older5. The incidence of MSAF increases with gestational age reaching as high as 30% in post term pregnancy. An increase incidence of MSAF is noted in presence of feto - maternal stress factors such as hypoxia and infection, independent of fetal maturation.

Meconium passage is a developmentally programmed post-natal event because 98% of healthy newborn pass meconium in first 24 to48 hours after birth [4]. Greater than 98% of cases MSAF are noted in fetuses at or following 37 weeks of gestation. MSAF commonly occur in post term pregnancies and is relatively rare in preterm deliveries[5]. MAS remains challenging condition confronting neonatologists. Avoidance of post term pregnancies and improving intrapartum monitoring are beneficial. Recent advances in understanding and management of acute lung injury such as appropriate use of positive end expiratory airway pressure, surfactant therapy, high frequency ventilation, and use of inhaled nitric oxide has led to reduced incidence of adverse outcome and improved survival rate of infants with MAS[5].

In recent years adopting the suggestion by **Carson et al** and **Linder et al** vigorous infants born with thin and thick meconium do not require tracheal intubation and suction. However, infants with poor tone and respiratory effort or apnea continue to be managed by attempted tracheal suctioning. Passage of meconium was significantly associated with severe asphyxia and carried a bad prognosis with increased risk of development of meconium aspiration syndrome, hypoxic ischemic encephalopathy, seizures and pulmonary air leak syndrome [6].

The present study was undertaken to review the clinical profile of meconium aspiration syndrome (MAS) in neonates in relation to birth weight and gestational age and their immediate outcome.

OBJECTIVES:

1. To study percentage of Meconium Aspiration Syndrome in babies born through meconium stained amniotic fluid and identify the neonatal risk factors associated with it.
2. To study the outcome of neonates born through meconium stained amniotic fluid at the time of discharge from the neonatal unit

MATERIALS AND METHOD

This prospective observational study was carried out on patients (Male/Female) neonates admitted in Neonatal Intensive Care Unit attached to Pediatric Department at Tertiary care hospital from western Maharashtra from February 2021 to August 2021. Total 66 Babies born with gestational age > 32 weeks with meconium or meconium-stained skin or meconium-stained umbilical cord or presence of meconium in the trachea at birth who were delivered normal, by caesarean section or forceps.

Still birth, babies delivered in outside hospital, multiple gestation, babies with congenital anomalies or new-borns having transient tachypnoea of new-born (TTNB) hyaline membrane disease (HMD), congenital pneumonia and sepsis, babies born through meconium-stained amniotic fluid with normal chest X ray were excluded.

METHODOLOGY:

A detailed antenatal history was elicited to find out the etiology of passage of meconium into the amniotic fluid. Natal history was taken to find out the type of delivery and indications for any interventions or drugs used for delivery were obtained. Postnatal history was obtained regarding Apgar score, birth asphyxia, cyanosis, or any other complication and for details of resuscitation measures done at birth.

During delivery, the type of delivery and any complications in the mother were recorded and resuscitative measures done were suctioning of the oropharynx by obstetrician after delivery of head and suctioning of trachea under direct vision using endotracheal tube was done by pediatrician until no meconium could be recovered from trachea. When required, endotracheal intubation was done and bag and tube ventilation was given. If baby was vigorous at birth, only orotracheal suctioning was done. Stomach wash was given to prevent further vomiting and aspiration of meconium-stained fluid from stomach. In all meconium-stained infants, APGAR score at 1 minute and 5 minute was assessed and gestational age assessment was done with Ballard's score. A detailed clinical examination was carried out and respiratory distress was monitored using Downes score system. If the score > 6 it was an indication for ventilation.

All infants with the diagnosis of meconium aspiration syndrome were admitted and treated in NICU with oxygen, restricted intravenous fluids, antibiotics, ionotropic support and ventilator support as and when required. In all cases of MAS, routine investigations like complete blood counts (Hb, TLC, DLC, platelets, PCV and peripheral smear) were done. Septic work up with ESR, CRP and blood culture were done when indicated. Radiological assessment was undertaken with serial x rays as directed by the condition. Transient metabolic disturbances with blood glucose, serum calcium, electrolytes and arterial blood gases (ABG) were done and interpreted when required.

RESULTS AND OBSERVATIONS:

The study was conducted over a period of one year from February 2021 to August 2021. During the study this period, out of 3120 deliveries, 632 (20.24%) babies had meconium-stained liquor & 66 had MAS (10.44%). The total number of babies admitted to NICU during the study period was 878 and out of them total number of cases with respiratory distress were 302. Out of 302 cases of respiratory distress admitted to NICU during the study period, 66 (21.85%) babies had MAS.

Characteristics Of New-borns:

In the present study; majority of the cases of MAS occurred in term babies with mean gestational age of 38-40 weeks. 33 (50%) babies belonged to 38-40 weeks of gestation and 19(28.79%) babies were of 40-42 weeks of gestation. 8 (12.12%) cases were of 34-36 weeks of gestation and 6 (9.09%) belonged to 36-38 weeks of gestation. None of the cases were below 34 weeks of gestation. (Table 1)

The mean birth weight of babies with MAS was 2.68 kg (1.7- 4 kgs). In our study, maximum number of cases of MAS were seen in babies with birth weight between 2.5-3.5kgs (n=34, 51.52%), followed by babies with birth weight between 1.5- 2.4 kg (n=28, 42.42%). Babies with birth weight between 3-3.4 formed 20.68% (n=6) of cases. Babies with birth weight > 3.5 kg had 4 cases each of MAS. (Table 1)

The sex (new-born) distribution was almost equal in both male and female with 54.55% cases in males and 45.45% cases in females. In our study fetal distress was found to be the commonest (n=34, 51.52%) factor associated with MAS followed by PIH (n=14, 21.21%), oligohydramnios (n=8,12.12%) and PROM (n=4, 6.06%). Six cases (9.09%) were not associated with any factor. (Table 1)

Table 1. Characteristics Of The New-borns:

Characteristics of New-borns		Number	Percentage
Gestational age (Weeks)	<34	0	0.00
	34-36	8	12.12
	36-38	6	9.09
	38-40	33	50.00
	40-42	19	28.79
Birth weight (Kg)	1.5 to 2.4	28	42.42
	2.5 to 3.5	34	51.52
	>3.5	4	6.06
Gender	Male	36	54.55
	Female	30	45.45
Associated Medical Conditions	Fetal distress	34	51.52
	PIH	14	21.21
	Oligohydramnios	08	12.12
	PROM	04	6.06
	Others	6	9.09
Type of Delivery	Caesarean section	27	40.91
	Normal vaginal	23	34.85
	Vacuum extraction	5	7.58
	Forceps delivery	11	16.67
Total		66	100.00

In our study, babies with MAS born by caesarean formed the highest percentage (n=27, 40.91%) of cases followed by babies born by normal vaginal delivery (n=23,34.85%). Babies born by outlet forceps delivery were (n=11,16.67%) and by vacuum extraction were (n=5,7.58%). (Table 1)

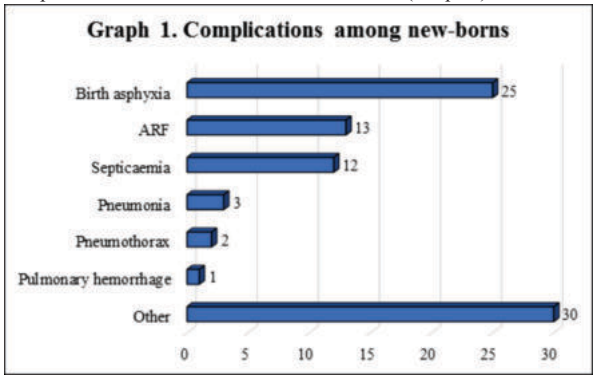
Scoring Of New-borns:

In this study, with 66 babies of MAS at admission 47 cases (71.21%) had Downe's score <4, and 16 cases (24.24%) had a score of 4-6; and 3 (4.55%) cases had score > 6 at admission. (Table 2) Out of all cases, 20 (30.30%) cases had severe asphyxia i.e., AS < 3 at 1 minute and 38 (57.58%) cases had mild to moderate asphyxia i.e., AS between 4-6 at 1 minute and AS > 6 is seen in 8 (12.12%) cases. (Table 2)

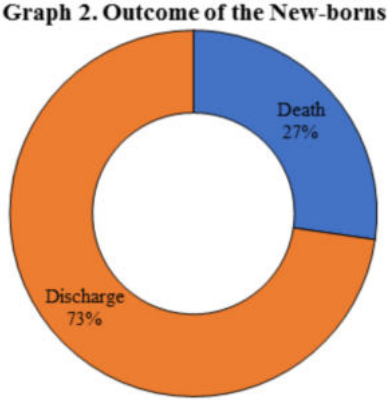
Table 2. Scoring Of The New-borns:

Scores		Number	Percentage
Downe's score	<4	47	71.21
	4-6	16	24.24
	>6	3	4.55
APGAR score at one minute	0-3	20	30.30
	4-6	38	57.58
	>6	8	12.12
Total		66	100

In our study of babies with MAS, the most common complication was birth asphyxia in (37.88%, n=25) of cases, followed by ARF in (n=13, 19.70%) cases. Septicemia was seen in 18.18% (n=12) cases, pneumothorax in 3.03% (n=2), pulmonary hemorrhage in 1.52% (n=1) and pneumonia in 4.55%. (n=3) of cases. Some babies had more than one of the above-mentioned complications. 30 babies (45.45%) had complication other than those mentioned above. (Graph 1)



Outcome Of The New-borns:



In our study, severe birth asphyxia was found to be the main cause of death in majority of cases followed by acute respiratory failure. Mortality occurred in 18 cases (27.27%).

Type Of Treatment Given To The New-borns:
In present study, conservative line of management was given with oxygen, restricted fluids, antibiotics, Vitamin K, calcium for 46 (69.70%) cases and only 20 cases (30.30%) needed ventilator support where indication was birth asphyxia, acute respiratory failure or other complications like pneumothorax. Out of 20 ventilated babies, 18 babies died and 2 baby survived and was discharged.

Table 3. Association Between Downe's Score, APGAR Score And Outcome Of The New-borns:

Scores		Outcome		Total	p value
		Discharge	Death		
Downe's score	<4	47	0	47	Fisher exact test p = <0.001
	≥4	1	18	19	
APGAR score	≤6	40	18	58	Fisher exact test, p = 0.03
	>6	8	0	8	
Total		48	18	66	

Above table shows that all 18 deaths belong to APGAR score less than 6 which indicate that deaths in babies with meconium aspiration syndrome was significantly higher in babies with APGAR score less than 6.

All 18 deaths belong to Downe's score greater than 4 which indicate that deaths in babies with meconium aspiration syndrome was significantly higher in babies with Downe's score greater than 4.

DISCUSSION:
The present study was undertaken to evaluate the clinical profile of 66 babies with meconium aspiration syndrome in relation to their birth weight and gestational age and immediate outcome. Out of 302 cases of respiratory distress admitted to NICU, 66 cases (21.85%) were diagnosed to have MAS. **Narang et al**[7], found that 10.55% was the incidence of MAS. In a study done at **Banaras Hindu University, Varanasi** incidence of MSAF was 14.3% of all the deliveries (253)[8]. incidence of MAS was 25% and 16.1% in a study by **Bhusan PK, et al**[9] and **Bharati Rao et al**[10] respectively. In the present study, as per the criteria for diagnosing MAS, we have excluded the babies born through meconium-stained amniotic fluid without respiratory distress and with normal chest X-ray.

Meconium staining of amniotic fluid and subsequently leading on to MAS was more commonly seen with associated maternal condition like fetal distress due to various causes; PIH and post term pregnancies. Incidence of these factors in the present study has been compared with those of other authors. The cause of fetal distress and neonatal respiratory distress in association with MSAF is not always clear. A prospective study was undertaken by **Coughtrey H et al**[11], who concluded 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 et al**[12]**,** and in 15.75% cases in a study by **Pravin and Usha Krishnaet al**[13] and in 11.20% by **Fujikura et al**[14]. In the present study it was 21.21%. Incidence of PROM was found in 6.60% cases by **Miller et al**[15], and in the present study it was 6.06%. **Trimmer et al**[2]**,** noted meconium passage in 38% cases of postdated pregnancy with oligohydramnios.

In a study at BHU, Varanasi it was found that fetal distress during labour and IUGR were significant risk factors associated with MAS[23]. In another study by **Hofmeyer GJ et al**[16] it was found that the presence of thick meconium staining of the amniotic fluid is an indication of oligohydramnios, as meconium passed into a normal volume of amniotic fluid will usually appear thin. In the present study only 10.34% cases were associated with oligohydramnios.

In the present study; babies with MAS, born by LSCS formed the highest percentage (40.97%) followed by babies born by normal vaginal delivery (34.85%) and (7.58%) by forceps delivery. These figures are almost in correlation with figures of study by **Narang et al**[10]**,** found 54.2% were born by LSCS and 30.7% by normal vaginal delivery and 11.8% by forceps delivery. Similar observations were seen in study at one hospital in **Jordan et al**[7].

Present study shows mean gestational age was 38-40 weeks**. Erkkola et al**[17]**,** found that 95% of cases were > 36 weeks gestation in their study. **Green and Paul**[18] says that prevalence of MAS increases to 10% or more after 38 weeks. In a study by **Eiden et al**[19] they found the frequency of meconium-stained amniotic fluid increased with increasing gestational age of fetus. In a study done by **Suresh GK et al**[20] and **Balcin I et al**[21]**,** it was found that the rate of meconium-stained amniotic fluid increases with advancing gestational age.

In the present study mean birth weight was 2.76kg. According to study by **Pravid Goud et al**[22] majority of babies weighed 2.5kg – 3kg and 4.2% of babies weighed >3.5kgs. In a study by **Suresh GK et al**[20]**,** the mean birth weight was 2685±536 gm in thick MSL babies and 2669±637 gm in thin MSL babies. **Rao et al**[10] showed that the birth weight of babies with MSAF were in the range of 1600-3800 gms, with mean birth weight of 2.516 gm.

In the present study with 66 babies; majority of them had moderate respiratory distress; assessed by Downes score (between 4–6) at admission. 3 baby had Downes score > 6 at admission and other babies who were ventilated developed progressive respiratory distress with maximum Downe's score of[23].

George and Goodling et al[23]**,** have demonstrated in puppies that meconium moves progressively to the periphery of lung with each breath, this is consistent with the observation that many infants with meconium aspiration are well for few hours after birth before developing progressive respiratory distress. A cohort study conducted in **Hong Kong between 1996 and 1999,** it was found that there was no evidence of difference in incidence of fetal distress between all MSL and clear liquour up to 38 weeks of gestation but there is strong evidence that babies with MSL were more likely to experience fetal distress compared to babies with clear liquor after 38 weeks of gestation[24].

In the present study, APGAR score recorded at 1 minute < 3 is found in (n=20) 30.30% of cases with severe birth asphyxia; 57.58% (n=38) of cases had APGAR score between 4-6 with mild to moderate birth asphyxia.

Abramovici et al[25]**,** found that APGAR at 1 minute was < 7 only in 7.5% of cases and **Miller et al**[26]**,** found that APGAR at 1 minute was < 7 in 25.40% of cases. In a cross- sectional study, it was found that a significantly greater incidence of Apgar score less than 7 at 1 minute for babies born through MSAF, compared with babies born with clear amniotic fluid.

In the present study birth asphyxia (n=25, 37.88%) was found to be most common complication followed acute respiratory failure (n=13, 19.70%) followed by septicemia (n=12, 18.18%), followed by pneumonia (n=3, 4.55%). Other complications like pneumonia, pulmonary hemorrhage have also been noted in present study.

In a study by **Wiswell TE et al**[27]**,** it was found that 11.53% babies develop pneumothorax. In National Neonatal Perinatal Database of India 2002-2003, perinatal asphyxia was single most common cause of death (40.5%) in babies born through MSAF with overall mortality of 11.6%. In present study 46 (69.70%) cases were treated conservatively whereas (30.30%) cases needed mechanical ventilator (MV) support. **Wiswell TE et al**[27] found that of the neonates with MAS, 29.7 % required MV and **Rossi EMet al**[104]**,** found 44% required MV.

Present study shows birth asphyxia was the main cause of death in 38.3% cases. Followed by ARF with pneumothorax in 24.6% of cases. **Narang et al**[7]**, (1993)** found that 53.8% cases of MAS had birth asphyxia and 15.8% had air leak and 3.8% had PPHN. **Wiswell TE et al**[27]**, (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. **Davis et al**[29] reported 12 deaths in 30 infants i. e. 40% mortality rate.

CONCLUSION:
Meconium aspiration syndrome (MAS) is one of the common causes of respiratory- distress in the new-born. During the study period, out of 3120 deliveries, 632 (20.24%) babies had meconium-stained liquor & 66 had MAS (10.44%). MAS carries a high morbidity and mortality. High mortality was associated with high Downe's and low APGAR score at 1 minute. Hence proper diagnosis and timely intervention can reduce the mortality and mortality meconium aspiration syndrome.

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