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

Paediatric Medicine

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ABSTRACT

Background: Meconium aspiration syndrome (MAS) occurs in 10% of infants born through meconium-stained amniotic fluid (MSAF). MSAF has been considered as the predictor of poor fetal outcome in relation to gestational age and birth weight. The present study was undertaken to evaluate the clinical profile of MAS in relation to gestational age and birth weight and their immediate outcome. **Method:** A total 138 neonates delivered vaginally or by caesarean section with MSAF and who diagnosed to have MAS that were admitted to the NICU during the study period of 1 year from 1st January 2021 to 31st December 2021 were included in the study. **Results:** The incidence of MAS was 10.55%. The commonest maternal factor associated with MAS were obstructed labour causing fetal distress (42.75%) followed by Post dated pregnancy with oligohydramnios (34.08%). Most of the cases of MAS underwent caesarean section (42.75%). The maximum incidence of MAS was seen in babies born with gestational age of 40 to <42weeks. Mean birth weight of babies was 2.8kg. Severe birth asphyxia was most common complication. 52 cases were given ventilator care. Mortality occurred in 36(26.08%) cases and birth asphyxia was found to be main cause of death in majority of cases (44.47%). **Conclusion:** MAS is an entity which is commonly seen in term and post term babies with birth weight >2.5 Kg. The increased incidence of MAS was associated with increase in the gestational age and in caesarean delivery. MAS carries a high morbidity and mortality. Hence the proper diagnosis and timely intervention can reduce mortality and mortality in MAS.

KEYWORDS

Meconium aspiration syndrome, Gestational age; Amniotic fluid, Fetal distress; Birth asphyxia

INTRODUCTION

Meconium aspiration syndrome (MAS) is one of the leading causes of respiratory distress in new-born all over the world [1]. The overall frequency of meconium-stained amniotic fluid (MSAF) varies between 5% to 25% [2]. Meconium aspiration occurs in 10% of infants born through MSAF. MSAF has been considered as the predictor of poor fetal outcome because its direct corelation to fetal distress and increase likelihood of inhalation of meconium with resultant deleterious effect on neonatal lungs [3].

In utero meconium passage rarely occur before 32 weeks of gestation and most babies with meconium-stained fluid are 37 weeks or older [4]. MSAF is seen in 8 to 20 % of all deliveries and may increase to 23 to 52 % after 42 weeks of gestation which has been attributed to gastrointestinal maturation [5]. Meconium passage is developmentally programmed post-natal event because 98% of healthy newborn pass meconium in the first 24 to 48 after birth [6]. Greater than 98% of cases of MSAF are noted in fetuses at or after 37 weeks of gestation [7]. MSAF commonly occurs in post term pregnancies and is relatively rare in preterm deliveries [8].

MAS remains challenging condition confronting neonatologist. Avoidance of post term pregnancies and improving intrapartum monitoring are beneficial. Recent advance in understanding and management of acute lung injury such as appropriate use of positive end expiratory pressure ,surfactant therapy, high frequency ventilation and use of inhaled nitric oxide has led to reduced incidence of adverse outcomes and improved survival rate of infants with MAS [9].

The present study was undertaken to evaluate the clinical profile of MAS in relation to gestational age and birth weight and their immediate outcome.

MATERIALS AND METHOD

After obtaining Institutional Ethical Committee approval and written informed consent from each participant's parents, this prospective observational study was conducted in NICU at tertiary health care centre in central India from 1st January 2021 to 31st December 2021. A total 138 neonates delivered vaginally or by caesarean section with MSAF and who diagnosed to have MAS and admitted to the NICU during the study period were included in the study.

The criteria used for diagnosing MAS [10]
Presence of 2 of the given

1) Meconium staining of liquor or staining of nails or umbilical cord or skin
2) Respiratory distress soon after birth, within one hour of the birth
3) Radiological evidence of aspiration pneumonitis (asymmetric patchy infiltrate)

New-borns admitted without respiratory distress, neonates with congenital malformations and parents who were not willing to give consent were excluded from the study.

A detailed antenatal history was elicited to find out etiology of passage of meconium into the amniotic fluid. Natal history was taken to find out the type of delivery. Postnatal history was obtained regarding birth asphyxia or any other complications and for detailed resuscitation measures done at birth. Records reviewed to obtain APGAR score. Gestational age assessment was done with new Ballard's score.

Table 1: APGAR scoring system

CRITERIA	0	1	2
Appearance	Pale or blue	Peripheral cyanosis	Pink
Pulse	Absent	<100	>100
Grimace (Reflex Irritability)	Floppy	Minimal response to stimulation	Prompt response to stimulation
Activity (Muscle tone)	Absent	Flexed arms and leg	Active
Respiration	Absent	slow and irregular	Vigorous cry

Electric weighing scale was used to measure the birth weight of the baby. Respiratory distress was monitored using Downe's score system. A detailed clinical examination was carried out and respiratory distress was monitored Using Downe's score.

Table 2: Downe's score system.

Sscore	0	1	2
Cyanosis	None	No cyanosis in 40% O2	Requiring >40% O2
Retractions	None	Mild	Moderate to severe
Respiratory rate	<60	60-80	>80
Air entry	Clear	Decreased	Barely audible
Grunting	None	Audible with stethoscope	Audible without stethoscope

If the score >6 it was an indication for ventilation. All newborns with the diagnosis of MAS were admitted and treated with oxygen, intravenous fluids, antibiotics, inotropic support and ventilator support as and when required. In all cases of MAS routine blood investigations done like complete blood count, septic work up with ESR, CRP, Blood culture were done. Radiological assessment was undertaken with serial x rays. Transient metabolic disturbances with blood glucose, serum electrolytes and arterial blood gases (ABG) were done and interpreted when required. Treatment of the newborn was the first priority and performance of the study was never interfered in treatment of child.

Statistical analysis

Different statistical analysis was performed by SPSS software version 22. Descriptive statistics was calculated for quantitative variables. Frequency along with percentages was calculated for qualitative and categorical variables. Chi-square test was used to find out significant association between two variables. P value <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

During the study period of 1 year, out of 7978 deliveries, 1308 (16.4%) babies had meconium-stained liquor and 138 babies (10.55%) had MAS. Total no. of babies admitted to NICU during the study period was 3396 of them 891 had respiratory distress. Out of 891 cases, 138 (15.4%) babies had MAS. Obstructed labour causing fetal distress was found to be the most common (n=59 , 42.75%) maternal factor associated with MAS followed by Post dated pregnancy with Oligohydramnios (n=47, 34.08%) as depicted in figure 1.

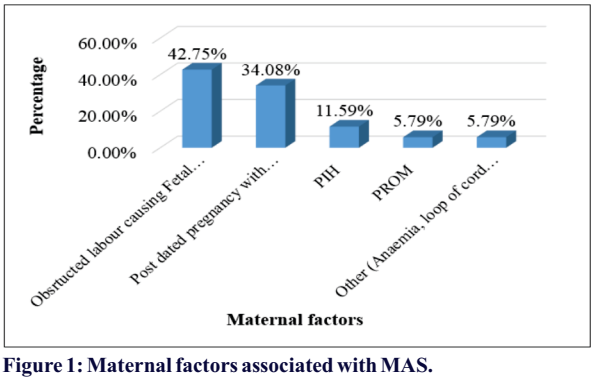

Figure 1: Maternal factors associated with MAS.

Babies with MAS born by caesarean section formed the highest percentage (59;42.75%) of cases followed by babies born by normal vaginal delivery (46;33.33%) as depicted in figure 2.

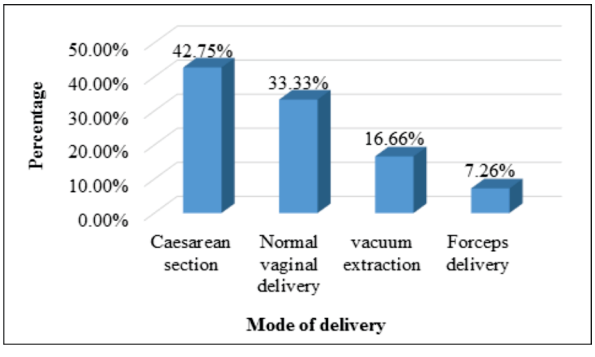

Figure 2: Mode of Delivery

The maximum neonates were males (51.44%). Majority of the cases of MAS occurred in term babies with gestational age of 40 to <42 weeks (42.75%). Most of the babies had birth weight between 2.500 to 2.999 kg (38.40%) followed by 2.000 to 2.499 kg (31.15%) as shown in table 3.

Table 3: Demographics data of neonates with MAS

Demographic data		No. of patients	Percentages
Gender	Male	71	51.44
	Female	67	48.56
Gestational Age (Weeks)	<34	00	0.0
	34-<38	09	6.52
	38-<40	14	10.14
	40-<42	59	42.75
	≥42	18	13.06
Birth weight (in Kg)	<1.5 kg	00	0.0
	1.501-1.999	05	3.62
	2.000-2.499	43	31.15
	2.500 -2.999	53	38.40
	3.000 -3.499	30	21.73
	3.500 -3.999	05	3.62
	≥4	02	1.48

Maximum i.e.,100 cases (72.46%) had Downe's score ≤ 4. Out of all cases 31 cases (22.46%) had severe perinatal asphyxia i.e APGAR score ≤ 3 at 1 minute and 93 cases (67.40%) had moderate perinatal asphyxia i.e APGAR score 4-6 at 1 minute and APGAR score > 6 was seen in 14 cases (10.14%) as shown in table 4.

Table 4: Assessment of respiratory distress with Downe's score and APGAR at 1 minute.

Variables		No of cases	Percentage
Downe's score	≤ 4	100	72.46
	5-6	25	18.11
	>6	13	9.43
APGAR score at 1min	0-3	31	22.46
	4-6	93	67.40
	>6	14	10.14

The most common complication was birth asphyxia (40.57%) followed by acute respiratory failure (14.49%) and septicemia (13.76%). Some babies had more than one complication. 12 babies (8.73%) had complications other than complication mentioned in table 5.

Table 5: Complications of MAS

Complications	No. of cases	Percentage
Birth asphyxia	56	40.57 %
Acute respiratory failure	20	14.49 %
Septicemia	19	13.76 %
Persistent Pulmonary Hypertension of newborn	14	10.14 %
Pulmonary hemorrhage	9	6.52 %
Pneumonia	5	3.62 %
Pneumothorax	3	2.17 %
Others	12	8.73 %

Mortality occurred in 36 cases (26.08%) as depicted in figure 3. Severe birth asphyxia was found to be the main cause of death in majority of the cases (16; 44.475) followed by birth asphyxia with acute respiratory failure (ARF) (n=9,25%) followed by birth asphyxia with ARF with septicemia (5; 13.89%), ARF + Pulmonary hemorrhage +Septicemia (4;11.12%) and ARF with pneumothorax (2;5.52%).

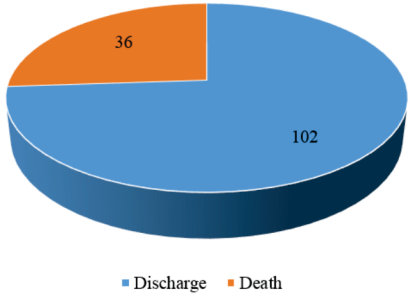

Figure 3: Neonatal outcome

The conservative line of management was given to 86 cases with oxygen, iv fluids, antibiotics vitamin k, anticonvulsants whereas 52 cases need ventilator support where indication was birth asphyxia, ARF and other complications. Out of 52 ventilated patients, 36 babies died and 16 babies saved and were discharged.

There was no statistically significant association between birth weight and outcome of patients with MAS, (P=0.508). Also, no significant association found between gestational age and outcome (p=0.109), (Table 6).

Table 6: Association of outcome with birth weight and gestational age

Birth weight	Outcome		P value
	Death	Discharged	
1.5 to 1.9	02 (5.60%)	03 (2.90%)	0.508
2 to 2.49	13 (36.10%)	30 (29.40%)	
2.5 to 2.9	15 (41.70%)	37 (36.30%)	
3 to 3.49	06 (16.70%)	25 (24.50%)	
3.5 to 3.9	00 (0.00%)	05 (4.90%)	
≥4	00 (0.00%)	02 (2.00%)	
GA (Weeks)			
34 - < 36	05 (13.90%)	04 (3.90%)	0.109
36 - < 38	1 (2.80%)	13 (12.70%)	
38 - <40	12 (33.30%)	26 (25.50%)	
40 - <42	14 (38.90%)	45 (44.10%)	
≥42	4 (11.10%)	14 (13.70%)	

DISCUSSION

In the present study, the incidence of MAS was 10.55% which is comparable with the study done by Narang A et al (10.45%) [11] and Uniyal P et al (11%) [12]. Obstructed labour causing fetal distress was found to be the most common (42.75%) maternal factor associated with MAS followed by post-dated pregnancy with oligohydramnios (34.08%), PIH (11.59%), PROM (5.79%) and 8 cases (5.79%) were associated with other factors (Anaemia, loop of cord around neck). These findings are correlated with the previous studies [13, 14]. Babies with MAS, born by LSCS formed the highest percentage (42.75%) followed by babies born by normal vaginal delivery (33.33%), 16.66% by vacuum extraction and 7.26% by forceps delivery. These figures are almost in correlation with findings of other authors [9, 11,12].

The sex distribution was almost equal with 51.44% of cases were male and 48.56% cases were females. Similar results found in the study done by Phirke et al [14]. In most of the cases MAS occurred in term babies with gestational age between 40 to <42 weeks, (42.75 %) which is comparable with the other studies [15, 16]. The maximum number of cases of MAS were seen in babies with birth weight between 2.500 to 2.999 kg follow by babies with birth weight between 2.000 to 2.499 kg. This finding is in accordance with Uniyal P et al [12] and Rao B et al [17].

Out of 138 babies, 100 babies had mild respiratory distress assessed by Downes score at admission. 13 babies were recorded to have Downe's score >6, one or two days or few hours after admission and were ventilated as per the recommendation and the recorded the maximum downe's score was 8. After giving appropriate treatment 102 cases recovered from respiratory distress and 36 cases expired. In study by Saranappa SSB et almajority of the babies had mild respiratory distress ,19% of the babies has Downe's score >4 on admission [18]. In the present study, APGAR score recorded at 1 minute <3 is found in 31 cases (22.46%) of cases with severe birth asphyxia; 93 cases (67.40%) of cases had APGAR score between 4-6. APGAR score > 6 is seen in 14 cases (10.14%). Similar consistent results found in the study done by Nath GDR et al [9] and Manivannan V et al [13].

The birth asphyxia (40.57%) was found to be most common complication followed acute respiratory failure (14.49%) followed by septicaemia 13.76%, followed by PPHN in 10.14% (n=14). Other complications like pneumonia, pneumothorax have also been noted. Similar findings are described in study done by Ashtekar SD et al [19] and Chaudhary R et al [20]. Out of 138 cases, 86 (62.32 %) cases were treated conservatively whereas 52 (37.68 %) cases needed ventilator support as similar to earlier studies [12, 21].

The mortality rate from MAS is vary widely. In the present study mortality occurred in 36 cases (26.08%) comparable with mortality in study done by Jaju et al (20%) [22]. The birth asphyxia was the main cause of death in 16 (44.47%) cases, followed by birth asphyxia acute respiratory failure in 25% of cases. Narang et al found that 53.8% cases of MAS had birth asphyxia [11]. In National Neonatal Perinatal Database of India 2002-2003, perinatal asphyxia was the single most common cause of death (40.5%) in babies born through MSAF with overall mortality of 11.6% [23]. No significant association noted between mortality and birth weight, also between mortality and gestational age. Consistent with the findings of Manivannan V et al [13]and Saranappa SSB et al [18].

Limitations

- First limitation is inherent in the study design, this is a single centre study.
- Relatively small sample size and small duration of study.

CONCLUSION

MAS is an entity which is commonly seen in term and post term babies with birth weight >2.5 Kg. The increased incidence of MAS was associated with increase in the gestational age and in 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. Hence proper diagnosis and timely intervention can reduce the mortality and mortality in MAS.

Recommendations

- Continuous intrapartum monitoring and early obstetric intervention, anticipation by the attending paediatrician in thick MSAF cases, followed by due neonatal resuscitations as per guidelines can reduce the morbidity, complications and the mortality.
- Judicious use of available modes of ventilation and adjunctive therapies, newborn with even the most severe meconium aspiration syndrome can usually be supported through the disease, with an acceptable burden of short and long term morbidity.

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