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Original Research Article

Meconium aspiration syndrome: clinical profile, risk factors and outcome in central India

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ABSTRACT

Background: Meconium aspiration syndrome (MAS) is a life-threatening respiratory disease affecting some neonates born through meconium-stained amniotic fluid (MSAF). MSAF complicates delivery in approximately 8% to 25% of live births, of which nearly 5% of the neonates born through MSAF develop MAS. The present study was undertaken to find out the prevalence of MSAF and MAS and to study the etiology, risk factors, clinical profile and outcome of MAS.
Methods: By purposive sampling technique, all newborns, fulfilling the inclusion criteria during one year of study period were enrolled in this hospital based cross-sectional observational study. Risk factors and clinical profile were compared between those who died and survived.
Results: Out of 8765 deliveries in hospital 1220 neonates were born with MSAF of which 94 neonates had MAS. Thereby, incidence of MSAF was 13.9% and incidence of MAS out of MSAF was 7.7 %. Of the 94 neonates who had MAS 13.82% died. Almost 3/4th of the MAS neonates were term and AGA. MAS were more common in primigravida mother (68%) and LSCS deliveries (53.2%). Of the total MAS 54.2% had thick meconium in whom mortality was 92.3%. The mortality in MAS cases was significant in low 5-minute APGAR score and non-vigorous baby.
Conclusions: Since MSAF is associated with higher morbidity and mortality, if the knowledge of risk factors is known to health care personnel then timely referral or intervention can help in decreasing MAS and its complications.

Keywords: APGAR score, Amniotic fluid, Meconium aspiration syndrome, Primigravida, Risk factors

INTRODUCTION

Meconium aspiration syndrome (MAS) is a life-threatening respiratory disease affecting some neonates born through meconium-stained amniotic fluid (MSAF). Meconium can be defined as the first stools passed by a newborn infant, usually passed within 24 hours of birth by more than 90% of newborn.[1]

Meconium staining of amniotic fluid (MSAF) complicates delivery in approximately 8% to 25% of live births, of which nearly 5% of the neonates born through MSAF develop meconium aspiration syndrome (MAS) and about 50% of these MAS neonates require mechanical ventilation.[2] MSAF is found to be associated with many maternal and neonatal risk factors, and it is one of the indicators of fetal distress.[3,4] Hence meconium for long has been considered to be a bad predictor of fetal outcome leading to higher neonatal morbidity and mortality.[5] Narang et al defined Meconium aspiration syndrome (MAS) as development of respiratory distress soon after birth in a neonate born through meconium-

stained amniotic fluid (MSAF) with characteristic radiological changes and whose symptoms cannot be otherwise explained.[6]

Cleary and Wiswell have proposed a severity criterion to define MAS based on percentage and duration of oxygen requirement:

- Mild MAS is a disease that requires less than 40% oxygen for less than 48 hours,
- Moderate MAS is a disease that requires more than 40% oxygen for more than 48 hours with no air leak,
- Severe MAS is a disease that requires assisted ventilation for more than 48 hours and is often associated with PPHN.[7]

The present study was carried out to understand the factors causing MAS and its clinical profile with their outcome, morbidity and mortality therefore prevention of MSAF and neonatal MAS can be achieved.

METHODS

The study designed was a hospital based cross-sectional observational study conducted in the Department of Paediatrics at Shri. Vasantrao Naik Government Medical College, Yavatmal, India from January 2016 to December 2016. This is the tertiary hospital situated in the hilly and tribal areas of central India. The study was approved by ethical committee of the institution.

Inclusion criteria

- Presence of meconium stained amniotic fluid with respiratory distress
- A compatible chest radiographs. By purposive sampling technique, all newborns, fulfilling the inclusion criteria for MAS were enrolled in this study.

Exclusion criteria

- Transient tachypnoea of newborn (TTNB), newborn with hyaline membrane disease (HMD) and preterm with gestational age<34 week

A detailed history in all included cases was taken with emphasis on the maternal and fetal risk factors focusing on antenatal and natal risk factors. Thorough clinical examination: vitals, general physical examination and systemic examination with special reference to respiratory tract system was done. All cases were subjected to chest radiograph, septic screen, kidney function test and neurosonography to rule out any complications.

Statistical analysis

Collected data was entered in MS-Excel 2007 and corrected for typographic errors and analysed using SPSS 16.0 version. The comparison of qualitative data was done using chi-square test. The confidence limit for significance was fixed at 95% level with p-value < 0.05 was considered significant.

For the purpose of the study following operational definitions were used:

- Prematurity was considered in any neonate born before 37 completed weeks, if the last date of monthly period was known or in infants whose estimated gestation by NBS (New Ballard Score) was less than 37 completed weeks.[8]
- Term neonate was described as having gestational age between 37 to 41 completed weeks. Persistent pulmonary hypertension of newborn (PPHN) was defined on the basis of labile oxygen saturation, a pre-and post-ductal oxygen saturation difference of >10% or pre-and postductal partial pressure of arterial oxygen (PaO2) difference of >20 mmHg with or without the presence of echocardiographic evidence of PPHN.[9]
- Hypotensive shock was defined as presence of low pulse volume, tachycardia, skin mottling and a capillary refill time >3 seconds.[10]
- A diagnosis of Hypoxic ischemic encephalopathy (HIE) was made based on Sarnat and Sarnat staging in babies ≥36 weeks of gestation and Levene's staging in babies <36 weeks.[11,12]
- MSAF was categorized on the basis of meconium consistency into thick (dark green in color, "pea soup" consistency with particulate matter) and thin (lightly stained yellow or greenish color) meconium.[5]
- The features of fetal depression/Non-vigorous neonate were delineated as absent/depressed respiration, heart rate < 100/minute and hypotonia.[13]

RESULTS

During the study period there were 8765 deliveries of which MSAF developed in 1220 (1220/8765, 13.9%) while MAS in 94 of these 1220 (94/1220, 7.7%). Mortality was seen in 13 (13.8%) of the total MAS neonates.

In this study, male outnumbered females and the male to female ratio was 1.93:1.

Majority of newborn with MAS were term and had birth weight of >2.5 kg whereas post term were 8 out of 94 MAS cases (8.5%). There were 51(54.3%) MAS cases who born with thick meconium of which 15 babies developed severe MAS and 12 out of which died.

The common maternal risk factors among MAS neonates are depicted in table I, with primiparity (68%) and LSCS (53.2%) were common risk factors.

Prolonged labor was the important maternal risk factor for mortality in MAS neonates and p- value was significant. (p=0.003) (Table 1).

Among the neonatal risk factors (Table 2), although the MAS was more commonly seen in AGA and term babies, but the morbidity and mortality was significantly seen among preterm, SGA babies and those having 5-minute APGAR score <3 (p=0.00) (Table 2).

In the study population of 94 MAS, thick meconium was seen in 54.2% cases with mortality was more in neonate having thick meconium (92.3%) and p-value was significant (0.003), (Table 3).

Table 1: Outcome of MAS neonates according to maternal risk factors.

Maternal risk factors		Outcome			
		Died	Discharged	Total	P-Value
Mode of delivery	LSCS	5	45	50	0.122
	NVD	8	36	44	
Parity	Multigravida	6	24	30	0.138
	Primipara	7	57	64	
Other risk factors	PIH	2	19	21	0.581
	APH	2	3	5	0.233
	PROM	3	22	25	0.62
	Prolonged Labour	8	25	33	0.003
	Anemia	4	19	23	0.365
	Oligohydramnios	2	9	11	0.172
Total		13	81	94	

Table 2: Outcome of mas according to neonatal risk factors.

Neonatal risk factors		Outcome			
		Died	Discharged	Total	P-Value
APGAR at 5 min	0 to 3	4	0	4	0
	4 to 7	9	30	39	
	8 to 10	0	51	51	
Birth weight(kg)	< 1.5	1	1	2	0.214
	1.5 to 2.5	6	23	29	
	2.5 to 3.5	6	55	61	
	> 3.5	0	2	2	
Gestational age	Post term	1	7	8	0
	Preterm	5	3	8	
	Term	7	71	78	
Gestational age according to birth weight	AGA	6	62	68	0.039
	LGA	0	2	2	
	SGA	7	17	24	
Fetal distress		8	27	35	0.051
IUGR		3	12	15	0.45
Total		13	81	94	

According to the table 4, there were 16 non-vigorous neonates and 13 of them died hence it was important risk factor for mortality in MAS (p=0.00). Other clinical features like acrocyanosis and shock were also significant factors for mortality in MAS.

Of the 94 MAS, 46 developed culture positive sepsis and 37 had HIE as complication during the study period. Mechanical ventilation was required in 15 cases.

Amongst the complication during study period culture positive sepsis, HIE, Atelectasis, and Mechanical ventilation were statistically significant for mortality in MAS, (Table 5).

Table III: Outcome of MAS as per consistency of meconium.

Consistency of Meconium	Outcome			P-Value
	Died	Discharged	Total	
Thick	12	39	51	0.003
Thin	1	42	43	
Total	13	81	94	

Table 4: Outcome of MAS as per clinical outcome of neonates.

Clinical features	Outcome			P-value
	Died	Discharged	Total	
Non-vigorous	13	3	16	0
Acrocyanosis	13	23	36	0
Hypotensive shock	12	17	29	0
Respiratory Distress	13	81	94	
Total	13	81	94	

Table 5: Outcome of MAS as per complications.

Complications	Outcome			P-value
	Died	Discharged	Total	
Culture positive sepsis	11	35	46	0.006
HIE	9	28	37	0.01
Atelectasis	11	10	21	0
Ventilated	13	2	15	0
Hypoglycemia	2	5	7	0.24
NNH	1	5	6	0.835
PPHN	0	1	1	0.687
Total	13	81	94	

DISCUSSION

There were total of 8765 deliveries during study period, of which 1220 newborn were born of MSAF thereby giving a prevalence of 13.9%. Of the 1220 born with MSAF 94 had MAS, hence the prevalence of MAS was 7.7%. The result is very similar to Swain et al who reported 13.92% of MSAF and 8.5% of MAS in his study, while lesser than that reported by Sori et al, and higher than Hanoudi et al.[14,15,16] The reported prevalence of MSAF from various other studies range from 5.6% to 24.6% and MAS occurs in 1.7 to 35.8% of these babies.[17,18] Hence the prevalence of MSAF and MAS in present study is well within the reported range. In the present study, male outnumbered female with male to female ratio being 1.9:1. This is comparable to study done by Hanoudi et al and Gayatri et al In the present study majority (82.9%) of the neonates were full term weighing > 2.5 kg.[16,17] This is in accordance with Narang et al and Sori et al while Gayatri et al and Joseph et al did not found preterm neonates in their studies.[6,15,17,19]

The most common maternal risk factor of MAS was primiparity accounting for 68.1% which is similar to Narang et al (57.14%) and Sori et al (66.8%).[6,15] Sori et al also stated that being a primiparous increased the risk of operative deliveries by three folds compared to multiparous women and might be accounting for increase chances of MSAF. In the present study 53% neonates delivered by ceasarean-section but mortality was more in vaginally delivered cases thereby indicate that in a high-risk mothers ceasarean-section should be method of choice for delivery. This is in synchronous to the finding reported by Narang et al (LSCS in 54.2%), Sori et al (LSCS in 43.7%) and Rajput et al (LSCS in 83%).[6,15,20] Among the other risk factors, prolonged labor is significant maternal risk factor for MAS reported in 35.1% neonates, PROM in 26.6%, oligohydramnios in 24.5%, anemia in 23%, preeclampsia in 22.3% and antepartum hemorrhage in 5%. This correlates with the findings of Vora et al who also stated that high risk situations are associated with increased likelihood of in utero passage of meconium, which if timely intervened can decrease the incidence of morbidity and mortality.[21] Prolonged labor was significant risk factor for mortality in MAS (p=0.003) in present study, probably because this is the referral centre catering 150 km radial distance hence the referred patient took longer time to reach the centre. Naveen et al was of the same opinion as he found prolonged labor to be significant risk factor for MSAF (p=0.002).[22]

Incidence of Antenatal Fetal distress and low 5-minute APGAR Score in the present study was higher than reported by other studies as there was high incidence of prolonged labor so chances of meconium passage in utero might increases which can be a cause and sign of intrauterine fetal distress and asphyxia.[5,20,21] Similar to present study, Louis et al and Jyoti et al observed higher incidence of morbidity and mortality in MAS neonates having lower APGAR score at 5 minutes of birth.[23,24] The incidence of thick meconium stained liquor was 54.3% which is significantly associated with morbidity and mortality in MAS neonates. This is in consistence with Hanoudi et al and Yong et al.[16,25]

In the present study, onset of respiratory distress in all the cases was since birth and 3 cases had no spontaneous respiration at birth which is similar to Louis et al according to him median age at onset of respiratory distress was 0 hour.[23] The mortality in MAS neonates were significantly found with Non-Vigorous neonate in this study, suggesting that meconium aspiration is predominantly an intrauterine event which occurs in response to continued fetal gasping in a hypoxic environment.

Culture positive sepsis was most common complication seen in 48.9% followed by HIE, and atelectasis in 39.4% and 22.3% of MAS neonates respectively. All of these complications have significant correlation with morbidity and mortality in present study. However only 1 case of PPHN was reported which is lower as compared to other study.[21,23] Louis et al had HIE and PPHN in 46% of cases and in 17% of cases respectively.[23]

Ashtekar et al in their study concluded that Birth asphyxia (42%), Sepsis (23.2%), and Jaundice (23.2%) were complications seen in neonates born with MSAF.[26] The requirement of mechanical ventilation in present study was 15.9% lesser than other studies, probably because we had low incidence of severe MAS.[21,23]

Mortality was 13.82% which is exactly similar to study of Jyoti et al who also reported mortality of 13.8% in MAS neonates.[24] Narang et al reported lower neonatal mortality of 7.7% whereas Gupta et al reported higher neonatal mortality of 22.2% in MAS cases.[5,6] Previous studies have shown a wide range (5-40%) in the mortality among infants with MAS, which is well correlated with this study.[27,28]

CONCLUSION

Hence, to conclude since MSAF is known to be associated with several maternal and neonatal risk factors hence the knowledge of these factors to health care personnel provides early prediction of adverse outcomes in neonates who can be timely managed and intervened to prevent meconium aspiration syndrome and its complications.

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