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Original Research Article

A STUDY ON ALL NEONATES BORN WITH MECONIUM STAINED AMNIOTIC FLUID

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ABSTRACT

Background: Recent advances in obstetrics and neonatal care has declined the incidence of MSAF in high income countries, but it is still high in low-income countries due to increased incidence of maternal complications and poor fetal monitoring. Several maternal as well as neonatal risk factors have been reported to be associated with MSAF and MAS. Through this study, we aim to study the risk factors, clinical profile, management strategies and outcome of neonates born through MSAF who develop MAS.

Material and Methods: A total number of 50 neonates born with MSAF were enrolled in the study after fulfilment of inclusion and exclusion criteria. Neonates were divided into vigorous and non-vigorous groups and those with and without MAS and further subclassified as per severity of MAS.

Results: In this study, out of 50(100%) enrolled neonates having MSAF, 32(64%) developed MAS. statistically significant association was seen with pH at birth (marker of birth asphyxia) ≤7.2 and development of MAS and severe MAS (P value=0.01). It was observed that all non-vigorous neonates with severe MAS had to be given ventilatory care, out of which 60% required ventilatory support during 1st hour of life and 40% in 1st 24 hours of life (p value =0.0013). mortality in the present study due to MAS was (9.4%).

Conclusion: Meconium-stained amniotic fluid is associated with increased incidence of caesarean section, perinatal asphyxia, lower APGAR score, higher NICU admissions and meconium aspiration syndrome. High risk pregnancies should be identified and both prenatal and postnatal interventions should be taken to reduce occurrence of MSAF. Intensive fetal monitoring and early intervention is required in reducing incidence of MAS. Complications and morbidity is higher in MAS group as compared to MSAF, especially in neonates who are non-vigorous.

Keywords: Meconium stained amniotic fluid, meconium aspiration syndrome, fetal monitoring, vigorous, non-vigorous.

INTRODUCTION

Meconium staining of amniotic fluid (MSAF) has been considered to be a bad predictor of fetal outcome and a major cause of perinatal mortality and morbidity. MSAF is found in 10-15% of births and occurs usually in term and post-term infants, of which 5% of MSAF babies develop Meconium Aspiration Syndrome (MAS),30% require mechanical ventilation and 3-5% die. Neonates born with MSAF are 100 times more likely to develop substantial respiratory distress than those born with clear amniotic fluid.[1] Several maternal as well as neonatal risk factors have been reported to be associated with MSAF and MAS like, nulliparity, ethnicity, gestational age >41 weeks, SGA, low APGAR score and mean low cord pH. Meconium causes mechanical airway obstruction with or without air leaks, pneumonitis and surfactant inactivation which leads to persistent pulmonary hypertension (PPHN), which is the major cause of morbidity and mortality among neonates with MSAF and MAS.[2] There are readily identifiable risk factors like antenatal fetal distress identified by antenatal fetal monitoring that can aid the clinician in predicting the risk of MAS and help in prevention

of MSAF and thus MAS. Advances in obstetrical and neonatal management have led to improvement in morbidity and mortality. However, intensive fetal monitoring and early intervention is required in reducing incidence of MAS and achieving favourable outcome.

MATERIALS AND METHODS

The present study is a prospective-observational study which was carried out in the Department of Paediatrics at Tertiary Care Hospital. Over a period of 2 years,50 neonates admitted in NICU born with MSAF were enrolled. Neonates with breech presentation, multiple gestation and those born with gross congenital anomalies were excluded from the study. As per pre-formed proforma detailed demographic data was noted. Gestational age was decided by using USG maturity, last menstrual period of mother and modified Ballard score for all neonates. A detailed maternal history was taken. Details about antenatal USG for maternal and fetal wellbeing, amniotic fluid and complications were inquired and confirmed from antenatal records. Data regarding antenatal fetal monitoring was obtained from mother's case files and records. Neonatal resuscitation was done regarding the latest NRP guidelines.[3] Silverman Anderson score and Downe's score was used to assess the respiratory distress and interventions were done accordingly. APGAR score was evaluated as per standard criteria at 1 minute and 5 minutes from birth. All anthropometric measurements at birth were taken by the doctor as per standard methods. Gestational age of neonates was considered according to Fenton's growth chart. Further management was done according to standard protocol and observations were noted regarding treatment and outcome. All neonates were divided into 2 groups, vigorous and non-vigorous and then those with MAS and without MAS. Neonates with MAS were further sub categorised according to severity in mild, moderate, and severe MAS.[5]

Data analysis: Data was analysed with appropriate statistical tool (SPSS version 27.0).

Statistical test: Chi square test using Yates correction and Fischer's exact test was used for calculating level of significance, considered at $p < 0.05$.

RESULTS

The present study included 50 neonates born with MSAF, out of which 32 neonates developed MAS. There was a male predominance in those having MSAF and even in those developing MAS. Neonates with gestational age >37 weeks and those having birth weight >2500 grams had higher risk for MSAF. Major maternal risk factors associated with MSAF were primigravida (38%), history of PIH (22%), age>30 years (18%), history of prolonged labour (16%), oligohydramnios (14%)and postdated pregnancies(12%).[6] LSCS was a more common mode of delivery seen in those with MSAF (84%) and MAS (90.63%) both. Antenatal fetal distress, neonates with nail staining, those with pH at birth <=7.2, low APGAR score (<7) at 1 minute and those with respiratory distress at birth had higher risk of development of MAS. Non vigorous neonates (83.33%) had higher risk of developing MAS than vigorous neonates (57.90%), whereas vigorous neonates were at higher risk of developing mild MAS.[7] No cases of severe MAS were seen amongst vigorous neonates and all of them survived. 83.33% non-vigorous neonates subsequently developed MAS (33.33 % mild,8.33% moderate, 41.67% severe), out of which 3 expired. MAS (64%), septicemia (28%) and Birth asphyxia (24%) were major complications in neonates with MSAF. Pneumothorax (4%) and PPHN (8%) were major complications causing mortality among neonates with severe MAS.[8] Mortality (9.4%) was seen only among non-vigorous neonates with MAS.[9]

Table 1: Association of gestational age and mas in various studies

DISTRESS SCORE AT BIRTH	MAS	NO MAS	TOTAL	P value
1 to 3	25(78.12 %)	7(38.88%)	32	0.70
4 to 6	2 (6.25 %)	0 (0 %)	2	
>6	5 (15.63%)	0 (0 %)	5	
No Distress	0 (0 %)	11 (61.12%)	11	
Total	32(100%)	18(100%)	50	

Table 2: Comparison of various maternal risk factors of MSAF in various studies

MATERNAL RISK FACTORS	PRESENT STUDY	SHAIKH et al[24]	BHATIA et al[25]	MUNDHRA R et al[22]
Primigravida	38%	-	-	-
PIH	22%	-	-	17%
Preclampsia		-	13.9%	-
Maternal age > 30 years	18%	-	-	-
H/O prolonged labour	16%	6%	-	-
Oligohydramnios	14%	-	-	-
Postdated pregnancies	12%	16%	32.4%	-
H/O PROM	10%	-	8.4%	19%

Table 3: Comparison of antenatal fetal distress and mas in various studies

ANTENATAL FETAL MONITORING	MAS			
	Present study	Fischer et al[26]	Soni et al[19]	Naveen et al[23]
Abnormal FHS	79.17%	75%	36.9%	27%

Table 4: Respiratory distress at birth and MAS (n=50)

GESTATIONAL AGE	MAS		
	Present Study	Mehar et al[18]	Hanoudi et al[11]
34-36weeks	3.12%	44.40%	7.70%
37-41 weeks	68.75%	51.90%	76.90%
>42 weeks	28.13%	3.70%	15.30%

Table 5: Association of APGAR score at 1 min and development of mas in various studies

Author name	Year	Sample size	APGAR<7 at 1min and developing MAS (%)	P value
Present study	2019-21	50	89.48 %	<0.008
Narang[29] et al	1992	238	33.2%	<0.01
Ranee[16] et al	2017	152	83.6 %	<0.001
Reddy[20] et al	2017	160	42.9 %	<0.05
Liu and Harington[30]	2002	708	66.7 %	<0.0001

Table 6: Association of vigorous and non-vigorous neonates with mild, moderate and severe MAS (n=50)

SEVERITY	NO MAS	MILD MAS	MODERATE MAS	SEVERE MAS	TOTAL	P value
Vigorous MSAF	16 (42.10 %)	21 (55.26 %)	1 (2.64 %)	0 (0 %)	38 (100 %)	0.0019
Non-Vigorous MSAF	2(16.67 %)	4 (33.33 %)	1(8.33 %)	5 (41.67 %)	12 (100 %)	
Total	18	25	2	5	50	

Table 7: Complications with Vigorous and Non-Vigorous MSAF

COMPLICATION	VIGOROUS MSAF (38)	NON-VIGOROUS MSAF (12)	TOTAL MSAF(50)
MAS	22(57.89%)	10(83.33%)	32 (64 %)
Septicemia	4(10.52%)	10(83.33%)	14 (28 %)
Birth Asphyxia	0(0%)	12(100%)	12 (24 %)
HIE	0(0%)	10(83.33%)	10(20%)
PPHN	0(0%)	4(33.33%)	4(8 %)
Pneumothorax	0(0%)	2(16.66%)	2 (4 %)
Oxygen Requirement >48 Hours	4(10.52%)	6(50%)	10(20%)
Ventilator Requirement >48 Hours	0(0%)	2(16.66%)	2(4%)
Expiry	0(0%)	3(25%)	3(6%)

Table 8: Outcome of neonates with mas and comparison with different studies

OUTCOME OF NEONATES WITH MAS	PRESENT STUDY (n=32)	REDDY et al[20] (n=21)	HANOUDI et al[11] (n=13)
Discharged	29(90.6%)	16(76.2%)	10(76.9%)
Death	3(9.4%)	5(23.8%)	3(23.1%)

DISCUSSION

Total 50 neonates were enrolled in the study over a period of 2 years. Out of which, MSAF accounted for 10.24% and MAS accounted for 6.55% of total NICU admissions.32(64%) babies developed MAS, out of which 25 were mild, 2 were moderate and 5 were severe MAS. Among those 5, 2 were successfully discharged and 3 got expired. In the study by Wiswell et al, incidence of MSAF was 12.1% and MAS was 5.4%. Male preponderance was seen in MSAF and MAS in our study and it was also observed in previous similar studies (Table). MSAF and MAS were seen predominantly in term neonates which was comparable with similar observations made by Gupta et al, Hanoudi et al and Vora and Nair. 86% babies with MSAF had birth weight 2500 gms or more and previous other studies also showed similar results. Obstetricians tend to be more aggressive in labours with MSAF to avoid fetal compromise leading to high caesarean section rate which was 84% in this study. On comparing various studies, most common risk factors found to be associated with MSAF were Primigravida, Postdated pregnancies, Prolonged labour, PROM, PIH and maternal age >30 years (Table). A highly significant result was obtained (P value=0.00006) thus proving an association between occurrence of MAS in neonates with abnormal FHS. Non-reassuring fetal heart rate tracing was found to be independent risk factor for development of MAS by Naveen et al. Statistically significant association was seen with pH at birth (marker of birth asphyxia) ≤ 7.2 and development of MAS and severe MAS (P value=0.01). This observation suggests that neonates who are chronically asphyxiated in utero have higher risk of developing MAS. Statistically significant association was found between APGAR <7 at 1 minute and development of MAS (P value=0.008) indicating that Apgar score <7 at 1

minute is highly associated with risk of developing MAS. This was also seen in studies by Narang et al, Liu and Harington, Reddy et al and Ranee et al. The risk of development of severe MAS was more with non-vigorous (41.67%) than vigorous neonates, and this was statistically significant (p value =0.0019). Whereas vigorous neonates had more risk of development of mild MAS (55.26%) as compared to non-vigorous neonates (33.33%) (table)This indicates that even vigorous neonates require close observation It was observed that MAS, septicemia, and oxygen requirement >48 hours were the only complications observed in both groups of neonates, however its occurrence was higher in the non-vigorous group of neonates. Rest of the complications like birth asphyxia, HIE, PPHN, pneumothorax and ventilatory requirement were found only in those with non-vigorous MSAF, suggesting they are at higher risk of acquiring complications related to MSAF.PPHN and Pneumothorax were the two major causes of mortality in this study.

CONCLUSION

From this study we concluded that, maternal risk factors associated with MSAF were primigravida, high maternal age, history of prolonged labour, oligohydramnios and postdated pregnancies. Antenatal fetal distress, neonates with nail staining, those with low pH at birth, with low APGAR score at 1 minute and those with respiratory distress at birth had higher risk of development of MAS. Complications and morbidity is higher in MAS group as compared to MSAF, especially in neonates who are non-vigorous. Thus, a combined approach is required from both obstetricians and neonatologists to prevent morbidity and mortality of babies born with MSAF. High risk pregnancies should be identified as soon as possible, and both prenatal and postnatal interventions should be taken to reduce occurrence of MSAF in neonates and thereby preventing MAS. Even vigorous neonates should be carefully observed for initial 24-48 hours as they also have high chances of developing MAS. Advances in obstetrical and neonatal management have led to improvement in morbidity and mortality. However, intensive fetal monitoring and early intervention is required in reducing incidence of MAS and achieving favourable outcome.

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