Early Neonatal Outcome in Babies Born with Meconium-Stained Amniotic Fluid - An Experience at a Tertiary Care Hospital

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ABSTRACT

BACKGROUND

Incidence of meconium-stained amniotic fluid (MSAF) is about 10 - 25 % of deliveries in India of which about 10 % develop meconium aspiration syndrome (MAS). The incidence of MAS has been declining in recent decades due to improved obstetric practices; however, it continues to be a major cause of neonatal morbidity & mortality which is why it remains a concern to both obstetricians and paediatricians. The role of timely intervention and referral assumes great importance in managing such high risk pregnancies in a developing country. Hence, the objectives of this study were to detect the incidence of MAS among the new-borns delivered through MSAF in a tertiary hospital, to identify antenatal and intrapartum risk factors associated with MAS and to determine the early neonatal outcome in babies born through MSAF.

METHODS

This was a prospective observational study carried out over one-year period in a level III neonatal unit where all neonates delivered through MSAF in the hospital were enrolled in the study. Detailed maternal history was noted, and neonates were managed as per the standards of NICU (Neonatal Intensive Care Unit) care along with laboratory investigations for infections during the study. Antenatal and perinatal risk factors along with clinical profile were studied in neonates born through MSAF and MAS.

RESULTS

A total of 2492 deliveries were conducted during the study period with 237 cases (9.51 %) having meconium stained amniotic fluid. There was a total of 29 cases that progressed to MAS and the total mortality was 5 neonates. Of all the antenatal co-morbidities noted, UTI (Urinary Tract Infection) (p-value 0.03) and chorioamnionitis (p-value 0.01) were found to have statistical significance for progression to MAS. Foetal distress, prolonged labour and thick meconium were associated with significant progression to MAS; however, only thick meconium was found to have increased mortality.

CONCLUSIONS

Progression to MAS is associated with high morbidity and mortality. Health care personnel should be apprised of antenatal risk factors and trained in perinatal management; timely referral or intervention decreases MAS and its complications.

KEY WORDS

Meconium-Stained Amniotic Fluid, Meconium Aspiration Syndrome, Risk Factors, Mortality

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BACKGROUND

The incidence of meconium-stained amniotic fluid (MSAF) is about 10 - 25 % of deliveries.[1-3] The aetiology of MSAF is thought to be due to the maturation of the gastrointestinal tract of the fetus which may account for the higher rates of MSAF in postdate deliveries but is generally believed that the presence of MSAF may be a marker of fetal compromise which might be associated with adverse neonatal outcome. Most of newborns with MSAF develop an effective respiratory adaptive response, but about 10 % develop respiratory distress at birth, presenting as a difficulty or delay in spontaneous breathing to features of aspiration and progressive hypoxia which is known as meconium aspiration syndrome (MAS). The incidence of MAS has been declining in recent past due to improved obstetric practices, including the avoidance of post-term pregnancy and increase in caesarean deliveries.[4] However, MAS continues to be a major cause of neonatal mortality, in addition to short and long term pulmonary and neuro-developmental morbidity,[5,6] which is why it remains a concern to both obstetricians and neonatologists. The role of timely referral assumes great importance in managing such high-risk pregnancies in a resource restricted country like ours where most peripheral centres do not have facilities for optimal fetal monitoring or providing essential newborn care. Hence, the objectives of this study were to detect the incidence of MAS among the newborns delivered through MSAF in a tertiary hospital, to identify antenatal and intrapartum risk factors associated with MAS and to determine the early neonatal outcome in babies born through MSAF.

METHODS

A prospective observational study was carried out over one-year period from Jan 2019 to Dec 2019 in a level III neonatal unit of a tertiary care centre in North India. The study was approved by the Institutional Ethical Committee. All neonates delivered through MSAF in the hospital and admitted in NICU were included in the study. Exclusion criteria included babies born with MSAF who were having congenital abnormalities, transient tachypnoea of newborn, hyaline membrane disease.

All the deliveries with MSAF were attended by a paediatrician or neonatologist and managed as per the latest NRP guidelines. Relevant maternal history were noted which included parity, diseases like pregnancy induced hypertension and diabetes, urinary tract infection, use of antibiotics, prolonged or difficult labour, intrapartum fever, presentation, consistency of meconium, mode of delivery, indication for operative delivery, fetal distress and obstetric complications. Neonatal data included gestational age, birth weight, gender, APGAR scores at first and fifth minute, neonatal resuscitation methodology required, need for NICU admission, and respiratory distress at birth.

The included neonates were followed for hospitalisation duration and morbidity associated with MAS such as hypoxia, type of ventilator support (invasive or non-invasive), antibiotics, and oxygen supplementation, additional use of surfactant, pulmonary hypertension, respiratory and / or metabolic acidosis and hypoxic-ischemic encephalopathy were collected and analysed.

Definitions used in the study were as per guidelines of National Neonatology Forum of India. Thick meconium-stained amniotic fluid was characterised by opaque and deep green jelly like liquor whereas rest was considered just as meconium-stained amniotic fluid.

The data collected was verified and transferred into MS Excel for further analysis as per prevailing standards and statistical analysis was done.

RESULTS

A total of 2492 deliveries were conducted during the study period with 237 cases (9.51 %) having meconium stained amniotic fluid. There were a total of 29 cases that progressed to MAS and the total mortality was 5 neonates. The number of primigravida mothers (51.5 %) was marginally more than multigravidas (48.5 %).

They also had higher incidence of MAS which was statistically significant (p-value 0.04) though no difference in mortality was noted. In all the antenatal co-morbidities noted, UTI (p-value 0.03) and evidence of chorioamnionitis (p-value 0.01) was found to be statistically significant for progression to MAS. No mortality benefit was noted in the absence of any of these antenatal variables (Table 1).

Sl. No.	Parameters	MSAF (N = 237)	MAS (N = 29)	P Value	Mortality (N = 5) No	P-Value
1 (a)	Primipara	122 (51.5 %)	20	0.04	4	0.19
(b)	Multipara	115 (48.5 %)	9		1	
2	GDM	26 (10.9 %)	5	0.15	1	0.38
3	PIH	29 (12.2 %)	4	0.78	0	-
4	UTI	23 (9.7 %)	6	0.03	1	0.43
5	Chorioamnionitis / intrapartum fever	31 (6.3 %)	8	0.01	2	0.07
6	Irregular antenatal care	39 (7.9 %)	6	0.51	2	0.14

Table 1. Maternal Risk Factors and Their Outcomes (N = 2492)

34 neonates in the study were born at term (97.8 %) with only 14.3 % through thick meconium stained amniotic fluid while majority of neonates had just meconium staining of amniotic fluid (119 / 50.2 %). The most common mode of delivery was caesarean section (CS), done in 79.3 % cases. CS did not have any advantage either in progression to MAS or mortality benefit. The most frequent indication for operative delivery was fetal distress (37.1 %) followed by prolonged or difficult labour (32.1 %), non-vertex presentation (17.7 %) and thick meconium (14.3 %). Fetal distress, prolonged labour and thick meconium were associated with significant progression to MAS, however, only thick meconium was found to have increased mortality (Table 2).

Incidence of MSAF was found to be more in male neonates (54 %) with the male-female ratio was 1.2:1. A total of 73 % babies born through MSAF had weight in the range of 2.5 and 3.5 kg. Resuscitation with positive pressure ventilation (PPV) and oxygen were required in 13.5 % and 8.2 % cases

respectively. Respiratory distress was present in 17.7 % cases and perinatal asphyxia and low APGAR (≤ 3) were found in 12.2 % cases. All the three parameters of respiratory distress, oxygen requirement at birth and very low APGARs were highly correlated with progression to MAS (Table 3).

Sl. No.	Parameters	MSAF (N = 237)	MAS (N = 29)	P Value	Mortality (N = 5) No	P-Value
1 (a)	Caesarean delivery	188 (79.3 %)	21	0.32	3	0.28
(b)	Vaginal ± Instrument delivery	49 (20.7 %)	8		2	
2	Non-Vertex presentation	42 (17.7 %)	9	0.04	2	0.18
3	Fetal distress	88 (37.1 %)	17	0.01	2	0.89
4	Prolonged labour	76 (32.1 %)	15	0.01	3	0.17
5 (a)	Meconium stained amniotic fluid	203 (85.4 %)	20	0.001	2	0.003
(b)	Thick meconium stained amniotic fluid	34 (14.3 %)	9		3	

Table 2. Delivery Associated Risk Factors and Their Outcomes

Sl. No.	Parameters	MSAF (N = 237)	MAS (N = 29)	P Value	Mortality (N = 5) No.	P Value
1 (a)	Male gender	128 (54 %)	16	0.89	3	0.78
(b)	Female gender	109 (45.99 %)	13		2	
2 (a)	Preterm	2 (0.8 %)	0	0.54	0	0.34
(b)	Term	232 (97.8 %)	28		2	
(c)	Post-dated	3 (1.26 %)	3		3	
3	Resuscitation with PPV	32 (13.5 %)	8	0.13	2	0.08
4	Requirement of O_2 for resuscitation	19 (8.2 %)	6	0.007	2	0.007
5	APGAR ≤3 at 5'	29 (12.2 %)	9	0.007	3	0.001
6	Respiratory distress at birth	42 (17.7 %)	11	0.002	3	0.01

Table 3. Neonatal Risk Factors and Their Outcomes (N = 237)

The requirement for admission in NICU was found to be in 74 babies (31.2 %). The indications for NICU stay were respiratory distress, birth asphyxia, prolonged or difficult labour, thick meconium and non-vigorous baby with depressed tone and neonatal reflexes. Total mortality noted was 5 babies (2.1 % of total MSAF or 0.2 % of study population). Severely depressed APGAR at 5', respiratory distress at birth, thick meconium and requirement of oxygen during resuscitation were found to be significant indicators of mortality.

DISCUSSION

Meconium stained amniotic fluid is commonly encountered in obstetric practice in post-dated and some term pregnancies. It is known to cause complications during delivery with higher rates of operative delivery as well as in neonatal period with severe birth asphyxia, pneumonitis with decreased lung compliance and PPHN (Persistent Pulmonary Hypertension of the Newborn) and even death. This study was done to identify the clinical indicators to identify the risk associated with meconium staining of amniotic fluid to help formulate early anticipation and timely referral of cases with high potential of complications. The incidence of MSAF in our study was 9.51 % with MAS in 1.2 %. This was comparable to other studies.[1,2] The incidence was higher in male neonates (54 %) though it was not significant statistically. It was comparable to studies done by Vineeta Gupta et al[7] and National Neonatal Perinatal database.[8]

Of all the maternal comorbidities, only chorioamnionitis and UTI was found to significantly increase the progression to MAS. There was no difference in mortality. Studies done by Romero et al.[9], Choi et al.[10] and Lee et al.[11] all indicate towards the role of inflammation due to chorioamnionitis as a contributing factor towards meconium staining of amniotic fluid and progression to MAS.

An incidence of 55 % amongst male neonates is comparable to current available literature.[9,10] This study indicates that 33 % women were post-dated which is consistent with Sankhyan Naveen et al,[12] Neke Akhtar et al[13]and Shaikh et al.[14] In the current study, 91 % babies were term and findings commensurate with other studies.[9,15] In our study, 53 % babies had birth weight in the range of 2.5 Kg and 3.5 Kg and also 40 % of babies had low birth weight. Incidence of caesarean section was 83 % in our study; however, this cannot be attributed to MSAF alone as there are multiple factors which need to be analysed before deciding on a caesarean section.

Of the numerous antenatal complications, anaemia, oligohydramnios and pregnancy induced hypertension, fetal distress had shown high prevalence in association with MSAF with an incidence of 30 %, 24 %, 14 % and 30 % respectively. In this study, incidence of oligohydramnios and PIH (Pregnancy Induced Hypertension) was higher than those reported by other authors,[7,8] probably because this study had been conducted in a tertiary centre.

Thick meconium is more associated with birth asphyxia, MAS and other neonatal outcomes as compared to thin meconium. Our study, with an incidence of 16 % observed perinatal asphyxia as main aetiology for NICU admission with respect to in utero passage of meconium. This observation was in concordance with conclusion of Neke Akhtar.[13]

This study showed that 19 % neonates were non vigorous and related predominantly with thick meconium (63.15 %) and required urgent resuscitation as per NRP protocols.[16] Incidence of neonatal death in the present study was 3 % and available literature displayed similar trends; 4.9 % in study of Vineeta Gupta et al[7] to 7 % in Takroni et al study.[17]

The study could have been improved by collecting data from peripheral centres and analysing the outcome. However, the comparative management of risk factors in a tertiary care centre and in a peripheral hospital will definitely have a bearing on the mortality and morbidity. The unavailability of trained professionals and adequate equipment for detection and monitoring makes it difficult to assess the risk factors and outcome in a scientific manner. Hence, under these circumstances, it is better to use the findings of this study for improving management of such cases in a peripheral hospital.

CONCLUSIONS

Knowledge of risk factors associated with MSAF provides early predictive value for adverse outcomes in neonates, who can be optimally managed by appropriate timely intervention in order to prevent severe asphyxia and related complications. The findings of this study assume significance in resource depleted settings and when availability of advanced perinatal care is hindered by the distance to hospital or lack of adequate facilities. Understanding of risk factors would give enough

time for the primary care giver to refer the patient to higher centre thereby reducing mortality and morbidity significantly.

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