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Original Research Article

Neonatal outcome in meconium stained amniotic fluid: a hospital based study

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ABSTRACT

Background: Amniotic fluid surrounds the baby in utero and provides a protective and low resistance environment and acts as a cushion for the baby. It is secreted by amniotic membranes, foetal skin and fetal urine. The objectives of this study was to identify the incidence of meconium stained amniotic fluid, perinatal outcome and the risks during pregnancy leading to in utero passage of meconium.
Methods: A prospective study conducted in Sri Guru Ram Das University, Amritsar, between 1st December 2014 to 1st June 2016. All live births with meconim stained amniotic fluid without congenital malformation, twin or multiple organ dysfunction were taken as subjects of this study. Maternal obstetric history and risk factors were asked and foetal parameters including gestational age, fetal presentation, mode of delivery, birth weight, sex, Apgar score, age at onset of respiratory distress, treatment and outcome were observed.
Results: Out of 1121 admissions in NICU, 12% of inborn and 9.6% of outborn were with MSAF, out of which 34% developed MAS. Majority of neonates were observed to be males (73.6%), term neonates (67.2%), weight 2.5-3.5 kg (76.9%) with mean weight being 2.701 kg±0.558 kg and 16% mortality including 9 inborn and 11 outborn neonates. Mean age at onset of respiratory distress was 18.43 minutes±11.52 minutes. Neonatal outcome was significantly related to weight, APGAR score at 5 mins, and development of complications like MAS, hypoxic ischemic encephalopathy, necrotizing enterocolitis, acute renal failure and severe thrombocytopenia. Culture proven septicaemia was seen in 21.6% cases. Mean duration of stay in NICU was 6.48 days±0.54 days.
Conclusions: MSAF has significant effect on perinatal outcome and close observation is required to prevent and treat complications thus reducing mortality.

Keywords: MAS, Meconium

INTRODUCTION

Amniotic fluid surrounds the baby in utero and provides a protective and low resistance environment and acts as a cushion for the baby. It is secreted by amniotic membranes, foetal skin and fetal urine. When foetus is in a state of stress, meconium is passed. Presence of meconium in amniotic fluid is a potentially serious sign of fetal compromise and associated with an increased perinatal morbidity and mortality.[1,2] It is associated with low APGAR scores, increased need for resuscitation, increased NICU admission, prolonged stay and high perinatal mortality.[3]

Meconium stained amniotic fluid is considered a harbinger of fetal compromise because of its direct correlation with fetal distress and increased likelihood of aspiration of meconium with resultant deleterious effects

on the neonatal lung.[4] Meconium passage is rare before 34 weeks of gestations and after 37 weeks its incidence increases steadily with increasing gestational age.[5] Passage of meconium in utero with staining of the amniotic fluid occurs in 12% to 16% of all deliveries.[6-9] Presence of meconium below the vocal cord is known as meconium aspiration and this finding occurs in 20% to 30% of all infants with meconium stained amniotic fluid with around 12% mortality.[7,9] Aspiration can occur in utero with fetal gasping or after birth with the first breaths of life.[10] As meconium staining amniotic fluid is associated with lots of adverse outcome of fetus and has long been considered to be a bad predictor of fetal outcome and as there is no significant data in our country, so this observational study was undertaken to find out immediate fetal outcome in meconium stained immediate resuscitation, hospitalization amniotic fluid and the requirement of and mortality.[11]

METHODS

A prospective observational study was conducted in department of Paediatrics of Sri Guru Ram Das University from December 2014 to June 2016 and study population was neonates who had meconium stained amniotic fluid. All new-borns with visible staining of amniotic fluid with meconium were enrolled for the study after written informed consent of parents. Twins, neonates with congenital malformations, multi organ dysfunction and those requiring surgery like intestinal obstruction, ARM etc. were excluded from this study. Detailed Maternal history was noted and delivery was attended by a paediatrician to record perinatal events in association with obstetricians. MSAF was divided into thick and thin on basis of consistency. All babies thus born with MSAF were shifted to NICU for observation and monitoring. Neonate was followed till discharge or death. Requirement of resuscitation, APGAR score at 1 and 5 min, birth weight was noted. Birth asphyxia was diagnosed when baby did not take spontaneous respiration at birth and Apgar scores at five minute was less than seven. Relevant investigations including chest X-ray were carried out. The gestational age was determined by ascertaining 1st day of last menstrual period. Data was analyzed by using SPSS version 12.

RESULTS

Total 85 inborn and 40 out-born babies were included during study period. Incidence of MSAF in the in-born and out-born babies among all children admitted in NICU and SNICU were 12% and 9.6% respectively as given in Table 1.

MAS developed in 34.4% (n=43) neonates including 26% of intramural and 52.5% of extramural neonates. 73.6% of total neonates with MSAF were males and 26.4% were females. Maximum babies were of term gestation (67.2%) followed by preterm and post term. Majority of the neonates were with weight 2.5-3.5kg (76.9%) followed by <2.5kg and >3.5kg. Mean birth weight in intramural and Extramural babies was recorded as 2.701kg±0.558kg and 2.827kg±0.613kg, respectively. It was found that neonatal mortality in intramural neonates with MSAF was 10.5% and 27.5% in extramural neonates.

Table 1: Total admissions with MSAF.

	Total admissions in NICU	With MSAF
In born	707	85 (12%)
Out born	414	40 (9.6%)
Total	**1121**	**125 (11.2%)**

Table 2: Neonatal factors in in-born and out-born neonates.

	In born (n = 85)	Out born (n = 40)	Total
MAS	22 (26%)	21 (52.5%)	43 (34%)
Male	60 (70.5%)	32 (80%)	92 (73.6%)
Female	25 (29.5%)	8 (20%)	33 (26.4%)
Pre-term	19	7	20.8%
Term	57	27	67.2%
Post-term	9	6	12%
Weight<1.5 kg	2	1	2.4%
Weight 1.5-2.5 kg	18	5	18.4%
Weight 2.5-3.5 kg	63	33	76.9%
Weight >3.5 kg	2	1	2.4%
Died	9 (10.5%)	11 (27.5%)	20 (16%)
Discharged	76 (89.5%)	29 (72.5%)	105 (84%)

Table 3: Factors affecting mortality in MSAF.

Neonatal weight	Died	Discharged	X^2 test
Weight<1.5 kg	10% n = 2	0.9% n = 1	p value 0.022
Weight 1.5-2.5 kg	30% n = 6	16.2% n = 17	df = 3
Weight 2.5-3.5 kg	55% n = 11	81% n = 85	
Weight >3.5 kg	5% n = 1	1.9% n = 2	
G.A. ≤366/7 weeks	30% n = 6	19% n = 20	0.376
G.A. 37-39 6/7 weeks	65% n = 13	67.6% n = 71	
G.A. ≥40 weeks	5% n = 1	13.4% n = 14	
Apgar <3	0	0	0.000
Apgar 4-6	72% n = 13	6% n = 6	
Apgar >7	18% n = 5	94% n = 93	

Mortality was highest among NBW neonates 55% (n = 11) followed by LBW neonates (30%, n = 6), VLBW neonates (10%, n = 2), and HBW neonates (5%, n = 1). Most of the neonayes with MSAF were term with highest mortality in same 65% but was not statistically significant. APGAR score was 4-6 in 72% (n = 13) neonates and >7 in 18% (n = 5) neonates in mortality group (highly significant, p = 0.000).

Table 4: MAS in relation to final neonatal outcome.

Meconium aspiration syndrome	In born		Out born	
	Died	Discharged	Died	Discharged
Absent	2 (3%)	61 (97%)	4 (21%)	15 (79%)
Present	7 (33%)	14 (67%)	10 (47%)	11 (53%)
p value	0.001		0.172	

Majority of the neonates had onset of respiratory distress within 30 minutes of birth with mean age at onset of respiratory distress being 18.43±11.52 minutes ranging from 0 minute to 16 hours. Blood culture and sensitivity test was sent as a part of septic screen of all 125 neonates and was suggestive of bacterial growth in 9.6% (n = 12) of inborn neonates and 12% (n = 15) of out born neonates.

It was observed that mortality caused by MAS was 33% in intramural and 47% in extramural neonates (statistically significant for intramural neonates).

Table 5: Onset of respiratory distress in neonates with MSAF.

Onset of respiratory distress	In born	Out born (n = 40)	Total (n = 125)
<30 mins	50 (78%)	20 (50%)	56%
30-60 mins	5 (8%)	3 (7.5%)	6.4%
>1 hour	9 (14%)	8 (20%)	13.6%
Within 24 hours	-	9 (22.5%)	7.2%
No respiratory distress	21	-	16.8%
Blood culture			
No growth	73 (58.4%)	25 (20%)	78.4%
Growth present	12 (9.6%)	15 (12%)	21.6%

Table 6: Other complications in neonates born with MSAF.

Complication	Inborn		p value	Out born		p value
	Died (n = 9)	Discharged (n = 76)		Died (n = 11)	Discharged (n = 29)	
HIE	6 (66%)	12 (16%)	0.002	7 (63%)	16 (55%)	0.9
Severe thrombocytopenia	5 (55%)	0 (%)	0.000	2	0	0.12
ARF	6 (66%)	2 (2.6%)	0.000	6 (54%)	3 (13%)	0.01
NEC	6 (66%)	2 (2.6%)	0.000	7 (63%)	5 (17%)	0.01

Table 7: Duration of stay in NICU in relation to outcome.

NICU stay	In born		Out born	
	Died (n = 9)	Discharged (n = 76)	Died (n = 11)	Discharged (n = 29)
<7 days	6 (67%)	59 (77%)	9 (82%)	6 (20%)
8-14 days	3 (33%)	11 (15%)	2 (18%)	13 (45%)
>14 days	0	6 (8%)	0	10 (35%)

Intramural neonates which died, also had HIE (66%), ARF (66%), NEC (33%) and severe thrombocytopenia (55%). Neonates died among extramural cases were also having NEC (63%), HIE (63%), ARF (13%) and severe thrombocytopenia (18%). This relation was statistically significant for HIE, ARF, NEC and severe thrombocytopenia in intramural babies.

In mortality group, 10.5% (n = 9) of inborn neonates died, 67% (n = 6) within 7 days and 33% (n = 3) within 8-14 days of admission. 89.5%(n = 76) of inborn neonates were discharged, 77% within 7 days, 15% (n = 11) within 8-14 days and 8% (n = 6) had prolonged NICU stay i.e. more than 14 days. Mean duration of NICU stay was 6.48±0.54 days. It was observed that most neonatal deaths were between 1-7 days.

DISCUSSION

This study was conducted to determine the incidence, determinants and comorbidities associated with MSAF in neonates admitted in NICU whether inborn or referred from other places of birth for management in a tertiary care hospital. In this study a total of 1121 neonates were admitted in the hospital out of which 707 were inborn cases and 414 were out born cases. Among them 125 were with MSAF including 12% of inborn admissions and 9.6% of out born admissions. Similar incidence was

reported by Jeena S et al (4.8%), Saldana et al (2.2%) and Hanoudi et al (4.8%).[12-14] Incidence of MSAF reported in other studies was 13.02% by Urvashi et al with 22.5% MAS and 15.76% by Naveen Sankhyan et al.[15,16] Incidence of MSAF was 8.4% (n = 12156) and the incidence of MAS was 15.6% of MSAF deliveries in National Neonatal Perinatal Database (NNPD).[11]

MAS developed in 26% intramural and 52.5% exramural neonates. In study by Afsar S et al, incidence of MAS in inborn and outborn neonates was 15.6% and 42.5% respectively.[17] Similar observation was made by Malik AS et al (38% intramural and 68% extramural neonates).[18]

In present study it was observed that of all intramural babies born with MSAF, 70.5%were males and 29.5% were females with M:F ratio of 2.4:1 with mortality in 4% and 7% of male and female neonates. In a study by Afsar S et al, 57.5% and 42.5% were inborn males and females while 57.2% and 42.8% were outborn males and females comparable to our study.[17] David et al in their study reported that 48% were male and 52% female and was contradictory to the present study.[19] Eva Guachan et al in their study had M:F ratio of 1.8:1 which was in line with our study.[20] In a developing country like ours, such a vast difference based on sex can be attributed to the uneven male female ratio and it is historically proven that MSAF was more common in male babies.

In our study 20.8% neonates were less than 37 weeks of gestation, 67.2% of neonates were between 37-40 weeks and 12% were more than 40 weeks. Since large number of neonates were of term gestation so mortality was also high in term neonates. In study conducted by Urvashi et al, 5% neonates were less than 37 weeks of gestation, 77.50% of neonates were between 37-40 weeks and 17.50% were more than 40 weeks and was consistent with our study.[15] Errkola et al found that 95% cases were more than 36 weeks.[21] In the study by Eiden et al, the frequency of meconium stained amniotic fluid increased with increasing gestational age of fetus i.e. 7% before 38 weeks, 78% between 38-42 weeks and 35% or more in pregnancies lasting longer than 42 weeks but in present study we have less number of cases in post term group, incidence of MSAF was low in post term babies.[22] Due to early intervention, gestation is not allowed to progress beyond term with either induction of labour or LSCS and thus delivering the baby and preventing the hazard of post maturity and neonatal morbidity and mortality. In present study, incidence of MSAF was more in neonates weighing 2.5-3.5 kg with mean weight of 2.701 kg±0.558 kg. Similar findings were observed by Afsar et al, Pravin goud and Usha Krishna and Ashtekar et al.[23,24]

In this study 10.5% of inborn and 27.5% of out born neonates born with MSAF died which was comparable with study by Narang et al (7.7%), Eva Guachan et al (14%), Usha et al (6%) and Jeena S et al (18.66%).[12,15,20,25] Out born neonates had higher rate of mortality as compared to inborn neonates due to reduced antenatal visits, delay in transport, poorly followed aseptic precaution as proven by more culture positive septicemia in out born neonates, absence of trained personnel for neonatal resuscitation, poor neonatal transport system.

Among 20 neonatal deaths, APGAR score at 5min was >7 in 72%, 4-6 in 18 and none <3, thus higher morbidity and mortality was observed score was <7 (8%, p<0.01). In a study by Gregory et al, APGAR score of <6 was observed in 40% neonates at 1min and in 5% neonates at 5mins and a mortality of 1.8%.[26] Miller and Sacks observed a 3.5 fold increase in incidence of lower 1 and 5 minute APGAR score and increased mortality when meconium stained amniotic fluid was present.[27] Majority of neonates had onset of respiratory distress within 30 minutes of birth. Similar findings were reported by Eva Guachan et al.[20]

Culture proven septicemia was seen in 21.6% cases; more in extramural than intramural cases and was similar to incidence reported by Afsar et al (35%), Anwar et al (27.5%) and Jeena S et al (21.3%).[12,17,28] Other complication observed, significantly associated with poor perinatal outcome were HIE, severe thrombocytopenia, NEC and ARF. Ashtekar S et al in their study concluded that Birth asphyxia (42%), Sepsis (23.2%), and Jaundice (23.2%) and others (7.8%) including IVH and NEC etc. were complications seen in neonates born with MSAF.[23] Narang et al found that 53.8% cases with MAS had birth asphyxia.[25]

Mean duration of hospitalization or NICU stay for inborn neonates was 6.48±0.54 days while no distinction was made on basis of type of meconium but Narli et al in their study reported the mean duration of hospital stay in thin MSAF neonates as 8.4 days and in thick MSAF neonates as 11.2 days while Priyadarshini et al reported duration of NICU stay days as 5.6 and 8.4 days for thin and thick meconium respectively and was in line with the present study.[29,30] Jeena S et al reported the mean duration of NICU stay as 9.2 days and 14.1 days for thin and thick MSAF neonates respectively.[12]

CONCLUSION

The overall incidence of MAS was 34% among cases of MSAF. Term babies with normal birth weight are more prone for MSAF than preterm neonates. Low APGAR scores with MSAF, despite resuscitation culminated in increased mortality. Not all neonates with MSAF develop respiratory distress at birth, some develop distress after few hours of birth. Close monitoring of all neonates born with MSAF is required and such babies are to be kept under observation in a tertiary care setting to reduce morbidity and mortality. Preterm neonates with MAS have more mortality than term neonates because of associated co-morbidities. Complications of MSAF include MAS, HIE, NEC, ARF and severe

thrombocytopenia. MSAF leads to prolonged NICU stay and increases the burden of disease on health care system.

So, in the end it is concluded that identification of pregnant woman at risk of passage of meconium during labour would allow intensive fetal surveillance and early intervention which might lead to reduction in neonatal adverse outcome and joint effort of obstetricians and paediatricians is required to reduce morbidity and mortality.

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