

Meconium Stained Amniotic Fluid Deliveries and Its Resulting Neonatal Outcome in a Tertiary Care Centre in Southern India

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Abstract

Context: Meconium stained amniotic fluid occurs as a result of foetal stress and therefore is considered to predict adverse foetal outcome, thus resulting in increased rate of operative deliveries. *Aims:* To determine immediate foetal and neonatal outcome and associated maternal obstetric factors. *Settings and Design:* Prospective observational study conducted in the Department of Obstetrics and Gynaecology and the Neonatology Unit in a tertiary care centre in Southern India. *Methods and Material:* Hundred pregnant mothers with meconium stained amniotic fluid delivered 102 babies. Maternal demographic details were noted and newborns were followed up till discharge. Their progress, complications and interventions were studied. *Statistical analysis used:* Frequencies and percentages of the various factors studied were determined. *Results:* Among the 100 mothers, 66% were primigravida and 73% of mothers belonged to the younger age group of 21 – 30 years. Only 4% of the mothers were post term, but 73% delivered towards term (38 + to 40 weeks). The mode of delivery was mainly by Caesarean (64%). Among the babies, a majority (81.4%) were asymptomatic while only 18.6% required any respiratory support. Among the sick babies, 89.5% improved with oxygen therapy alone. Only two babies required endotracheal intubation in the delivery room and required further ventilatory support, and one was treated for shock. Only 27.4% of these babies required prolonged stay (> 72 hours) in the Neonatal Intensive Care Unit and majority (47.6%) required only short term antibiotics (≤ 3 days). Sepsis was suspected in 41.2% babies of which C Reactive Protein was positive in 16.6% while Blood culture positivity was there in 9.5% of those screened for sepsis. Only 26.2% required antibiotics for longer than 5 days. *Conclusions:* Meconium stained liquor is in itself, always not a determinant for adverse neonatal outcome. Other associated factors in a mother like hypertension complicating pregnancy, Intrauterine Growth Restriction and gestational diabetes also contribute to poor foetal outcome. Meticulous monitoring during labour and timely intervention for the mother by the obstetrician and immediate expert resuscitation results in better foetal outcome and brings down the perinatal morbidity in MSAF.

Keywords: Meconium Stained Amniotic Fluid (MSAF); Foetal Outcome; Neonatal Outcome.

Introduction

Amniotic fluid surrounds the baby in utero and is contributed to by the amniotic membranes, foetal skin and urine passed. The incidence of passage of

meconium in utero staining amniotic fluid occurs in 12-16% of all deliveries [1]. Occurrence of meconium passage is less common before 34 weeks of gestation, and increases after 37 weeks of gestation. The onset of meconium passage increases with gestational age

indicating the maturation of foetal intestinal myelination and parasympathetic innervations [2].

Meconium is usually passed when the foetus is in a state of stress. Variations in foetal heart rate, passage of meconium in amniotic fluid, abnormal cardiotocograph and decreased foetal scalp blood pH are all strong indicators of foetal distress [3,4].

Thus obstetricians consider Meconium Stained Amniotic Fluid (MSAF) as a dire warning in obstetrics. Maternal and foetal risks contribute to MSAF. Maternal factors are post-term pregnancies, preeclampsia - eclampsia and gestational diabetes, while the complicating foetal factors are many like oligohydramnios and Intra-uterine growth restriction (IUGR) [3,5]. Meconium in amniotic fluid indicates acute or chronic hypoxic events thus making it an indicator of foetal compromise [6].

MSAF warrants more neonatal care/resuscitation as seen from the increased incidence of Neonatal Intensive Care (NICU) admissions, respiratory problems [7], lower Apgar scores and higher perinatal morbidity and mortality [8,9]. Over the years with improved antepartum and intrapartum surveillance as well as neonatal care, there has been an evident decline in still births, decreased perinatal morbidity and better neonatal outcome.

Our aim was to study the foetal outcome in deliveries and to evaluate the associated maternal risk factors in 100 mothers whose pregnancy were complicated by MSAF.

Materials and Methods

This prospective observational study was conducted at the Department of Obstetrics and Gynaecology and Neonatology Unit in a tertiary centre for 100 consecutive mothers who had amniotic fluid stained with meconium. The study population was 102 babies born to these 100 mothers who had in-utero passage of meconium during delivery. This study included pregnant mothers with cephalic presentations who were noted to have MSAF and excluded mothers who had babies with congenital anomalies, malpresentations and intrauterine death. Detailed maternal history - personal characteristics like age, parity and gestational age were noted. Progress of labour was assessed and foetal status monitored by intermittent electronic monitoring and auscultation of foetal heart rate at regular intervals. When MSAF was noted after spontaneous rupture of membranes or after Artificial Rupture of Membranes (ARM) the mode of delivery was decided upon based on cardiotocograph and vaginal examination

findings. In mothers where findings were favourable, the vaginal route with continuous electronic foetal monitoring with a low threshold for Caesarean section was the obstetric decision employed.

Resuscitation steps for the neonate were done as per latest recommendations of the Neonatal Resuscitation Program (NRP) of the American Academy of Pediatrics (AAP). Babies who were non-vigorous at birth as per definition, were intubated and tracheal suction was performed. Babies who improved and had stable heart rates with good respiratory efforts were extubated while those who had poor respiratory effort and tone were continued to be ventilated till they improved. All babies born through MSAF were admitted in NICU as per hospital protocol since they warranted observation for complications of perinatal asphyxia and to be watched for problems of respiratory distress needing respiratory support. Neonatal outcome was determined based on need for resuscitation, ventilation and days of NICU admission.

Babies whose mothers had a background to suggest sepsis or had respiratory distress were screened for a suspicion of sepsis with blood counts, C-Reactive Proteins (CRP) and Blood Cultures. Antibiotics were empirically started pending the sepsis screen report. The babies with C Reactive Protein (CRP) negative had their antibiotic therapy stopped at availability of a negative initial Blood culture report. Those who remained symptomatic or had blood culture positive, needed longer duration of antibiotics. In those babies who had a positive CRP raising the suspicion of sepsis, antibiotics were continued for a maximum period of 5 days if symptomatically well.

Statistical analysis involved determining the frequency and percentages of the various factors studied.

Results

There were 1370 deliveries during this period. Out of these 102 babies were born to 100 mothers through MSAF. Among the mothers [Table 1], primigravidae was 66% and only 34% were multigravidae. Majority (73%) of the mothers belonged to the younger age groups (21 - 30 years). Teenagers < 20 years were only 2% and 25% of the mothers were of the older age group (31 to 40 years). Only 4% of mothers were post term and 5% of mothers gave birth to preterm babies. The mothers who delivered with MSAF were predominantly of term gestation (38+ to 40 weeks). Caesarean section was done in 64% of mothers (Figure 1).

There were associated obstetrical complications which could have contributed to MSAF - maternal hypertension and Preeclampsia (9%), Gestational Diabetes Melitus (9%), Intra-uterine Growth Restriction and oligohydramnios (4%). Other factors that may have contributed to a higher caesarean rates were previous caesarean (10%) and prolonged premature rupture of membranes (8%). There were other few medical complications like hypothyroidism, anaemia, cardiac disease and platelet disorders, which are not known to be of much association.

The babies born to mothers with MSAF were resuscitated as per the latest neonatal resuscitation guidelines with intubation and suction in babies who were non-vigorous at birth. All babies born through MSAF (thin or thick) were observed in the NICU as per hospital protocol, for presence / absence of

respiratory distress or other complications of perinatal asphyxia. Sepsis screening was done in babies with high suspicion or risk of sepsis and antibiotics were started which was stopped based on the test screen results and baby's symptomatic improvement.

Out of a total of 102 babies born through MSAF, 83 (81.4%) remained asymptomatic [Table 3]. They did not warrant use of any supplemental oxygen or other respiratory support. Two babies (10.5%) needed intubation in the delivery area for tracheal suction for being non-vigorous at birth. They needed continued ventilation in the NICU in view of poor respiratory efforts. Only one (0.9%) of the babies required inotropic support for shock as a result of concomitant asphyxia. That baby was ventilated.

Table 1: Maternal demographic features (n=100 mothers)

Order of Pregnancy	Numbers	Percentage
Primigravida	66	66
Multigravida	34	34
Age of mother	Numbers	Percentage
≤ 20 years	2	2
21 - 30 years	73	73
31 - 40 years	23	23
Gestation	Numbers	Percentage
< 36 weeks	5	5
36+1 - 38 weeks	18	18
38+1 - 40 weeks	73	73
> 40 weeks	4	4

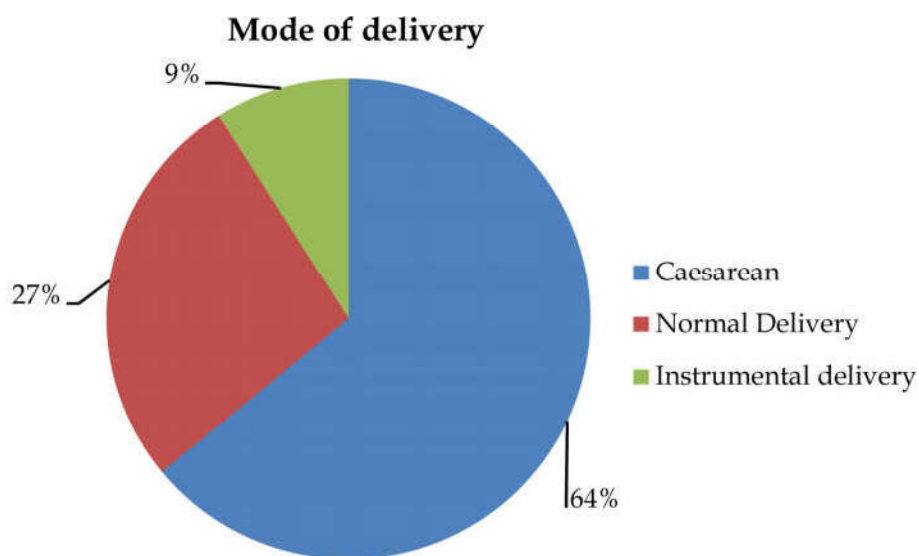


Fig. 1: Mode of delivery in mothers (n= 100 mothers)

Table 2: Obstetric Risk factors (n=100 mothers)

Obstetric Risk Factor	Numbers	Percentage
Prolonged pregnancy	4	4
Hypertensive complications	9	9
Chronic Hypertension		
Pre Eclampsia		
Partial HELLP		
Previous caesarean	10	10
Oligohydramnios	4	4
PROM	8	8
Gestational Diabetes Mellitus	9	9
Gestational Thrombocytopenia	2	2
Chronic ITP		
Hypothyroid	6	6
Polyhydramnios	1	1
Intra Uterine Growth Restriction	7	7
Rheumatic Heart Disease	2	2
Twins	2	2
Psychiatric illness	1	1
Anemia	1	1

* Some mothers had more than one risk factors

HELLP - Haemolysis, Elevated Liver enzyme levels, Low Platelet levels

PROM - Prolonged Rupture of Membranes

ITP - Immune Thrombocytopenic Purpura,

Table 3: Presentation of babies born through MSAF and support needed (n=102)

Symptoms	Number	Percentage
Asymptomatic	83	81.4
Respiratory support	19	18.6
Oxygen Therapy	17	89.5
ET intubation	2	10.5
Ventilation	2	10.5
Shock needing inotropes	1	0.9
No inotropes	101	99.0

ET intubation - Endotracheal intubation

Table 4: Babies worked up for sepsis (worked up or suspected) (n=42)

	Number	Percentage
Suspected and screened	42	41.2
CRP		
Positive	7	16.6
Negative	35	83.3
Blood C/S		
Positive	4	9.5
Negative	38	90.4
Not suspected, not screened	60	58.8
Total	102	100

Table 5: Duration of antibiotic use in babies with suspected or proven sepsis (n=42)

Duration	Total	Percentage	Mean duration
≤ 3 days	20	47.6	3 days
4 - 5 days	11	26.2	4.8 days
> 5 days	11	26.2	8.4 days

Table 6: Duration of NICU stay in babies who were born through MSAF (n=102)

Total	Total	Percentage	Mean stay
Up to 24 hours (1 day)	28	27.4	24 hours
> 24 - 72 hours (> 1 till 3 days)	46	45.1	2.4 days
> 72 hours (>3 days)	28	27.4	9.4 days
			5.1 days

Table 4 shows the details of babies suspected and investigated for sepsis. The babies needing any kind of respiratory support were clinically indistinguishable from Early Onset neonatal Sepsis (EOS) and were screened for sepsis. Other causes, like maternal Prolonged Rupture of Membranes (PROM) or maternal pyrexia were other reasons to screen babies for EOS. There were a total of 42 (41.6%) babies screened, of which 38 babies did require some respiratory support. Blood culture positivity was seen in 4 (9.5%) of those who were screened and 7 (16.6%) had CRP positive as a marker of sepsis.

Most babies 20 (47.6%) required antibiotics for less than 3 days when CRP was negative and Blood cultures were sterile, with 26.2% needing more than 5 days of antibiotics when CRP positive [Table 5]. Culture positive babies or symptomatic babies were continued on antibiotics longer.

NICU stay [Table 6] was determined by symptomatology and need for respiratory support was shortest (less than 24 hours) in 28 (27.4%) of babies who remained well. Twenty eight (27.4%) babies needed more than 72 hours in NICU. Average NICU stay of babies who were symptomatic was 9.4 days.

Discussion

MSAF is an often countered problem during obstetric practice occurring in up to 20% of deliveries. It is a cause of anxiety in obstetrics as it is a frequent cause of poor foetal outcome.

In this study, majority (66%) of mothers who had MSAF were primigravidae with a predominance of (73%) of mothers belonging to the younger age group (21-30 years). Only 25% mothers were of the older age group (31-40 years). A study conducted in Bangladesh determined their population to have a mean gravidity of 1.8 (± 0.9 SD) and the mean age of mothers with MSAF to be 24.5 \pm 4.9 years [8]. The data in our study was in accordance with that of Mundhra [10] and Desai D S et. al. [11] who identified primigravidae to be 80% and 93.38% respectively in their studies. Younger age groups also constituted 65.45% [10] and 64.7% [11] respectively in the above studies.

It has been evident from previous studies that increased rate of MSAF occurs in late gestational age [8,12,13]. Literature indicates meconium passage of 30% at 40 weeks and 50% at 42 weeks [14,15]. This is because the foetus secretes motilin in increased quantities as gestational age advances and the levels

are high in post-dated pregnancies [12,13]. Here only 4% of mothers went beyond date; however 73% of mothers who had MSAF here delivered towards term (38+ to 40 weeks).

Mode of termination was mainly (64%) by Caesarean section. Other obstetrical factors like previous Caesarean and preeclampsia also could have contributed to high Caesarean rates. Studies by Khatun, Erum Majid Sheikh and Saunders K reported Caesarean rates to be twice high in mothers with MSAF [9,16,17].

Obstetrical problems like placental insufficiency, maternal hypertension, preeclampsia, oligohydramnios and post-dated pregnancies are known to result in passage of meconium [18]. This study had 9% of mothers having preeclampsia and a similar percentage of gestational diabetes, 7% had IUGR and 4% with oligohydramnios. Only 4% were having post dated pregnancy and premature rupture of membranes was there in 8% of mothers. Sadaf et al also reported a low incidence of preeclampsia (5%) and gestational diabetes (1.25%) in MSAF deliveries, which was similar to this study [19]. This could be because both study groups were of small numbers.

All babies who were born through MSAF in our study population were admitted in the NICU for observations for development of complications of meconium aspiration as per unit protocol.

Admission criteria are not specified in most other studies but presence of symptomatology including respiratory distress could have warranted NICU stay in most studies [20-23]. Respiratory distress with need for any respiratory support - supplementary oxygen or ventilation, was present in 19 babies (18.6%) while the rest (81.4%) remained asymptomatic. Two babies in our study population had need for delivery room intubation and continued on ventilation for respiratory failure. One of these two babies needed inotropic support for shock, no other complications or mortality was noted.

Nearly eighty percent of 165 babies in the study by Mundhra et al were asymptomatic at birth while 21.21% babies needed NICU admission and all 5 babies who had meconium aspiration syndrome (MAS) died [10].

In a study of 72 babies, Shikha Bansal et. al. noted that 9.7% needed NICU admission with 5.6% needing ET intubation at birth with mortality of 2.8% [20]. Vaghela et. al. document that 30% of babies in their study needed NICU admission [2]. They noted that asphyxia and aspiration contributed to a mortality of 5% in their study population [2]. Singh G et. al. included inborn as well as outborn babies in their

study and documented Hypoxic Ischemic Encephalopathy, severe thrombocytopenia, acute renal failure and necrotising enterocolitis as other complications that were seen in their population [21]. These complications led to death in 10.6% of their inborn babies [21]. Of a total of 75 babies who were admitted into the NICU Jeena S et al, report a high rate of mortality in 14 (18.7%) [22]. In a study from Bangladesh, asphyxia was noted in 20% with need for Endotracheal suction in 5% [8]. Twenty five percent of babies had respiratory distress postnatally suggestive of Meconium aspiration syndrome (MAS) and they noted a mortality of 4% in their study population of 160 cases [8].

Babies born through MSAF were compared with equal number of normal controls for outcome by Desai D et. al., who looked at 150 cases out of which 18% had features of MAS with a similar number needing oxygen therapy (vs. an oxygen use in 10.7% of controls) [23]. They looked at need for intubation at any time (directly related as well unrelated to MSAF or MAS) and reported ET intubation need to be 8.7% while a higher incidence of 10% was noted in the normal controls. Ventilatory support was also needed in 4% (vs. 2.7%) and increased use of inotropes for shock (4% vs. 1.3%) in the study population. Mortality in babies with MSAF was 11.3% vs 6.7% in the control population [23].

Asymptomatic babies were shifted out of NICU in 24 hours (27.4%) and most babies could be shifted by 72 hours. Longer duration of NICU care was needed in only 27.4% babies in our study group. Longer hospital stay with about 33% needing more than 1 week of hospitalization in inborn babies was reported by Singh G et. al. [21]. Of a total of 75 babies studied by Jeena S et. al. who were admitted into the NICU 35 (46.7%) needed NICU stay for more than 7 days while there were 13 (17.3%) who needed more than 2 weeks of NICU stay [22].

Babies who were screened for sepsis (41.2%) included the symptomatic babies who had respiratory distress or maternal history to suggest a background for infection of whom 16.6% had a positive sepsis screen and 9.5% had Blood culture showing growth. All these babies were initiated on antibiotics empirically and 47.6% were stopped in less than 3 days as screen was negative and were clinically well. Longer duration antibiotics (> 5 days) were given in 26.2% who symptomatically took longer to settle or had positive sepsis tests or culture positivity. Desai et al reports a sepsis screen positivity of 6.67% in MSAF babies (vs. 2% in the control group) and blood culture positivity of 9.33 (vs. 6.67% in the control group) [23]. They gave antibiotics to 10.7% of babies

with MSAF vs. a higher 14% antibiotic use in the control group [23].

Conclusion

Foetal meconium passage during labour is a common occurrence. Timely intervention by the obstetrician at the earliest detection of foetal distress with effective electronic foetal monitoring and interpretation will go a long way in preventing and limiting poor foetal and neonatal outcome. A higher rate of operative deliveries may be justifiable if imminent vaginal delivery is unlikely and MSAF is also associated with other obstetrical risk factors. Availability of trained personnel to provide care to the baby at the delivery is of paramount importance in significantly cutting down on morbidity and mortality.

Acknowledgement

None

Conflict of Interest: Nil

Key Messages

Meconium staining of liquor is an indicator of foetal distress and by itself can be a cause for morbidity and mortality in the foetus and neonate if foetal compromise continues. Obstetrical monitoring and early termination of pregnancy helps limiting further foetal compromise, along with proper resuscitation results in an improved outcome for the baby.

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