

# Associated Factors and Outcome of Babies Born Through Meconium Stained Amniotic Fluid

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## ABSTRACT

### Background

Neonates born through meconium stained amniotic fluid (MSAF) are associated with significant morbidity and mortality.

### Objective

To study the incidence, associated factors and outcome of meconium stained amniotic fluid babies born in Dhulikhel hospital.

### Method

Prospective, cross-sectional study conducted in Obstetric ward and Neonatal Intensive Care Unit (NICU) from 15 December 2015 to 15 December 2016. All the babies born through meconium stained amniotic fluid during the period were included.

### Result

Incidence of meconium stained amniotic fluid was 6.5%(167/2581). Meconium aspiration syndrome (MAS) developed in 9(5.4%) among all meconium stained amniotic fluid cases. Primigravidity and postdatism were observed more in Meconium aspiration syndrome group than meconium stained amniotic fluid group (77.8% VS 73.4%; 33.3% VS 26.3%). Babies delivered by caesarian section were more in meconium stained amniotic fluid group than Meconium aspiration syndrome group (47.5% VS 33.3%). All the babies with meconium stained amniotic fluid improved except one baby with Meconium aspiration syndrome who expired. Neonatal sepsis was a significant co-morbidity in Meconium aspiration syndrome group (P value= 0.008). There was increased incidence of operative delivery in thick meconium stained amniotic fluid than thin meconium stained amniotic fluid (52.6% VS 38.9%). Similarly, Neonatal Intensive Care Unit admission and neonatal complications like Meconium aspiration syndrome, perinatal asphyxia and sepsis were more commonly observed in thick meconium stained amniotic fluid group than thin meconium stained amniotic fluid group.

### Conclusion

The progression to meconium aspiration syndrome in babies with meconium stained amniotic fluid is not associated with any maternal and neonatal factors studied. MAS babies are 10 times more likely to require NICU admission and sepsis is a significant co-morbidity. Thick meconium stained amniotic fluid is worrisome. There is increased chance of operative delivery and neonatal complications if associated with thick meconium stained amniotic fluid.

## KEY WORDS

*Meconium, Meconium aspiration syndrome, Meconium stained amniotic fluid*

## INTRODUCTION

Meconium is the thick, dark green, sticky, tar like substance passed as the baby's first bowel motion after birth. At times this can be passed before the baby is born, discoloring the waters. The passage of meconium in utero is a potentially a threatening perinatal problem. The detection of meconium is a cause of concern for both the obstetrician and the attending pediatrician. The meconium stained amniotic fluid (MSAF) occurs in 7-22% of pregnancies, especially in term and post term.<sup>1-3</sup> Although the precise etiology of MSAF is still unclear, risk factors include advanced gestational age at delivery, mode of delivery, prolonged second stage of labour and intrauterine infection.<sup>4</sup>

Literature about the prevalence and clinical significance of MSAF report that MSAF, particularly the thick meconium is related with fetal distress, Meconium aspiration syndrome (MAS), asphyxia, sepsis, pulmonary disease and death. The risk factors for passage of meconium in utero and the progression of meconium stained babies to cases with MAS have been extensively studied in the past.<sup>5,6</sup> According to western data there has been a reduction in the incidence of MAS in the past decade due to advances in perinatal care.<sup>7</sup> This has been attributed to better obstetric practices. Studies done in Nepal have shown incidence of MSAF to be 14-14.6% and MAS to be 6.6-8.5%.<sup>8,9</sup> Still there is paucity of data in Nepal regarding risk factors and neonatal outcome of babies born through MSAF.

This study is aimed to assess the perinatal attributes, morbidity and mortality associated with babies born through MSAF. The study would reflect the prenatal and postnatal care of babies delivered through MSAF and the improvement as required in the perinatal health services so that adverse outcome is prevented as well as minimized.

## METHODS

This was a prospective, cross sectional study conducted in the Obstetric ward and NICU of Dhulikhel hospital, Kathmandu University hospital. It was a one year study from 15 December 2015 to 15 December 2016. Universal sampling method was used. Ethical approval was taken from the Institutional Review Committee (IRC). A written consent was taken from the parents. A semi-structured proforma was designed and piloted with 27 cases. All live born babies born during the period was included. Babies born outside the hospital and stillbirths were excluded.

Thick meconium was defined as greenish meconium with particulate matter in amniotic fluid/pea soup consistency. Thin meconium was defined as light yellow or light green staining of amniotic fluid. Non-vigorous baby was defined as a baby with heart rate less than 100 beats per minute, poor respiratory effort or poor muscle tone. Neonates with consistent CXR findings whose respiratory distress would not otherwise be explained was defined as MAS.

Any newborn baby who failed to sustain breathing soon after birth or required resuscitation or Apgar score of 6 or less soon after birth was labelled as perinatal asphyxia. A newborn was said to have neonatal sepsis if blood culture was positive or if two or more of the following parameters were positive- leukopenia ( $TLC < 5000/mm^3$ ), neutropenia ( $ANC < 1800/mm^3$ ), immature to total neutrophil(I/T) ratio  $> 0.2$ , C-reactive protein (CRP) positive.

Gestational age assessment was based on one or more of the following – certainty of dates, ultrasound examinations, and assessment of new born using expanded new Ballard score.<sup>10</sup> Pregnancy Induced Hypertension(PIH) was defined as blood pressure more than or equal to 140/90 mmHg after 20 weeks of gestation on two occasions at least 6 hours apart.<sup>11</sup> Anemia was defined as hemoglobin of less than 10 gm%.<sup>12</sup> Antepartum Hemorrhage(APH) was defined as bleeding from or into the genital tract after 28 weeks of gestation and before birth of baby.<sup>13</sup> Maternal fever was defined as temperature of more than or equal to 38°C within 1 week prior to delivery.

All the data were entered in Microsoft excel and analysed by SPSS 23. Descriptive data was tabulated in frequency and percentage. Bivariate analysis was done with chi-square test for categorical data and Mann-Whitney U test was done for numerical data.

## RESULTS

All the live inborn babies in Dhulikhel were enrolled. Total number of deliveries was 2581, out of which 167(6.5%) deliveries were with MSAF. Most of them belonged to Tamang community 61(36.5%), followed by Newar 37(22.2%), Chhetri 32(19.2%), Brahmin 27(16.1%) and Dalit 10(6%). Most of them were from Kavre district 97(58.1%), followed by Sindhupalchowk 34(20.4%), Bhaktapur 18(10.8%) and Ramechhap 9(5.4%). Mothers with age less than 20 years were 12(7.2%), 20-35 years were 151(90.4%) and more than 35 years were 4(2.4%). Mothers who had ANC in Dhulikhel hospital were 107(64.1%), whereas 56(33.5%) had ANC outside Dhulikhel hospital and 4(2.4%) had no ANC visit.

Among the associated factors, APH, PIH, fever and anemia were seen in 2(1.2%), 5(3%), 6(3.6%) and 9(5.4%) cases respectively. None of the mothers with MSAF smoked. Most of the babies were born at term pregnancy. Term babies comprised 121(72.5%) whereas postdated babies comprised 44(26.3%). Most of the babies were born by normal vaginal delivery. 86(51.5%) and 78(46.7%) babies were born by normal vaginal and cesarean section respectively. Most of the babies 94(56.3%) were male. The number of babies with weight less than 2.5 kg, 2.5-3.5 kg and more than 3.5 kg were 13(7.8%), 130(77.8%) and 24(14.4%) respectively.

Only 12(7.2%) babies were non-vigorous at birth. The number of babies shifted to NICU were 22(13.2%). Only

2(1.2%) babies required mechanical ventilation. MAS was seen in 9(5.4%) babies. Perinatal asphyxia was seen in 3(1.8%) babies. Neonatal sepsis was seen in 3(1.8%) babies, but none were blood culture positive. Out of 22 babies admitted in NICU, 21 improved. However, one baby left against medical advice. On phone call review, the baby had expired.

The demographics and associated factors of MSAF and MAS have been shown in table 1. MAS was observed more in primigravida mothers and postdated pregnancy. However it was not statistically significant.

**Table 1. Demographics and associated factors of MSAF and MAS.**

	MSAF alone (n=158)	MSAF with MAS (n=9)	P- value
Mean age(years)	24.6	25.6	
Primigravidity	116(73.4%)	7(77.8%)	0.7
ANC > 4	48(30.4%)	3(33.3%)	0.8
APH	2(1.3%)	0	1
PIH	5(3.2%)	0	1
Anemia	9(5.7%)	0	0.4
Rh -ve mother	4(2.6%)	0	1
Postdatism (> 40 wks)	41(26.3%)	3(33.3%)	0.6
Birth wt (< 2.5 kg)	12(7.6%)	1(1.1%)	0.9
Birth wt (> 3.5 kg)	23(14.6%)	1(11.1%)	0.9

P- value of < 0.05 is statistically significant

The mode of delivery and the outcome have been shown in table 2. Caesarian section was less in the MAS group compared to non-MAS group (33.3% VS 47.5%) however it was statistically insignificant. None of the babies in the MAS group required mechanical ventilation. Two(22.2%) in MAS and only one(0.6%) in MSAF group had neonatal sepsis, and it was statistically significant (P value= 0.008). Perinatal asphyxia was seen more in MAS group compared to non-MAS group (11.1% VS 1.3%) however it was not statistically significant.

**Table 2. Mode of delivery and outcome**

	MSAF alone (n=158)	MSAF with MAS (n=9)	P-value
Normal vaginal delivery	80(50.6%)	6(66.7%)	0.6
Caesarian	75(47.5%)	3(33.3%)	0.6
Instrumental	3(1.9%)	0	0.6
NICU admission	14(8.9%)	8(88.9%)	0.0
Mechanical Ventilation	2(1.3%)	0	1
Neonatal sepsis	1(0.6%)	2(22.2%)	.008
Perinatal asphyxia	2(1.3%)	1(11.1%)	.1
Median stay in NICU in days (Median±IQR)	3±12	4±4	0.2

P- value of < 0.05 is statistically significant

**Table 3. Frequency and type of amniotic fluid of the MSAF**

	No. of cases	Percentage (%)
Thick meconium	95	56.9
Thin meconium	72	43.1
Total	167	100

The incidence of thick and thin MSAF have been shown in table 3. The comparison between the delivery mode and outcome of babies with thick and thin MSAF have been shown in table 4. NICU admission, MAS, perinatal asphyxia and neonatal sepsis were more in the thick MSAF than the thin MSAF group however they were statistically insignificant.

**Table 4. Comparison between the mode of delivery and outcome of thick and thin MSAF**

	Thick MSAF (n=95)	Thin MSAF (n=72)	P-value
Caesarian	50(52.6%)	28(38.9%)	0.2
Instrumental	2(2.1%)	1(1.4%)	0.2
Normal vaginal delivery	43(45.3%)	43(45.3%)	0.2
Non vigorous	10(10.5%)	2(2.8%)	0.07
NICU admission	16(16.8%)	6(8.3%)	0.1
MAS	6(6.3%)	3(4.2%)	0.5
Perinatal asphyxia	3(3.2%)	0(0%)	0.2
Neonatal sepsis	2(2.1%)	1(1.4%)	1

P- value of < 0.05 is statistically significant

## DISCUSSION

The incidence of MSAF varies greatly in different reports and our observation of 6.5% falls within the reported range of 5 to 24.6%.<sup>14</sup> Our incidence of MAS of 5.4% is quite low compared to 18 to 24% in other studies.<sup>15-18</sup> This may be due to regular antenatal visits and less antenatal risk factors like anemia, PIH, APH and liberal use of caesarian section in our study group. Yoder et al. studied changing obstetric practices associated with incidence of MAS and identified a four-fold decrease in the rate of MAS over a period of nine years. They attributed this to amnioinfusion, higher cesarean section rate, early ultrasound evaluation, significant decrease in postdate births, and frequent diagnosis of non-reassuring fetal heart rate pattern.<sup>19</sup>

In the current study, there was 26.3% postdated pregnancies in mothers with MSAF, comparable to 28% in a study conducted by Sundaram et al.<sup>20</sup> The hormone motilin is secreted in ever increasing quantities by the fetus as gestation advances and most meconium passage are said to occur in postdated gestations, because the motilin levels are highest then.<sup>21</sup> Low birth weight tends to be associated with placental insufficiency, which favors the incidence of MSAF.<sup>22</sup> However there was no correlation of birth weight with MSAF in our study.

Several studies have quoted postdatism as a risk factor for MAS.<sup>23-25</sup> However there was no such correlation in our study. In our study, MAS was strongly associated with neonatal sepsis (P value=0.008) which is similar to other study.<sup>24</sup> However still larger studies are needed to prove the association.

The current study showed thick MSAF of 57% and thin MSAF of 43%. Though statistically insignificant, babies born by caesarian section were more with thick MSAF than thin MSAF which is similar to the study by Rokade et al.<sup>26</sup> Similarly non-vigorousness, NICU admission, MAS, perinatal asphyxia and neonatal sepsis were seen more in the thick MSAF group than the thin MSAF group though statistically insignificant.

Other maternal risk factors like premature prolonged rupture of membrane could not be addressed. Mothers who had uncomplicated delivery and discharged home early if their baby had infection, it could not be addressed. Similarly if their baby developed MAS later at home, it could not be reported.

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## CONCLUSION

During deliveries, meconium staining is a commonly observed phenomenon. Increased incidence of MAS was found in postdated pregnancy. The progression to MAS in babies with MSAF was not associated with any maternal and neonatal factors studied. Neonatal sepsis was more common in MAS group. Increased incidence of caesarian section, NICU admission, MAS and co-morbid conditions like asphyxia and sepsis were seen more in the babies born with thick MSAF. Hence thick MSAF should not be overlooked. Standard antenatal care and early institution of caesarian section for high risk cases in resource-limited settings may bring down the incidence of MAS and co-morbid conditions.

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