

# Risk Factors and Outcome of Neonates Born through Meconium Stained Amniotic Fluid in a Tertiary Hospital of Nepal

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## Abstract

**Introduction:** The incidence of meconium aspiration syndrome is still high in the developing world contributing significantly to the neonatal mortality. The study was aimed to know the risk factors contributing to meconium aspiration syndrome and neonatal outcome in a tertiary government hospital of the country. **Materials and Methods:** It was a hospital based cross sectional study done over a period of three months. All live newborns born through meconium stained liquor were enrolled and all the details regarding mother, neonate were recorded. Odd's ratio and bivariate analysis was done to assess the risk factors for meconium aspiration syndrome. **Result:** Out of all the deliveries 14.6% were meconium stained amniotic fluid and meconium aspiration syndrome developed in 6.6% of the neonates. Low Apgar score and premature rupture of membranes was significantly associated with the risk of occurrence of meconium aspiration syndrome. Neonates who developed meconium aspiration syndrome had mortality of 11.3%. **Conclusion:** Perinatal asphyxia and premature rupture of membranes were significantly associated with the development of meconium aspiration syndrome and neonates who developed meconium aspiration syndrome had high mortality.

**Key words:** Asphyxia, meconium, neonate

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## Introduction

Meconium Aspiration Syndrome (MAS) is an important cause of morbidity and mortality among newborns in the developing world. Meconium stained amniotic fluid (MSAF) occurs in approximately 13% of all live births<sup>1</sup>. Presence of meconium is a sign of fetal distress warranting immediate evaluation and action. It can lead to MAS. MAS is defined as respiratory distress in an infant born through MSAF whose symptoms otherwise cannot be explained<sup>2</sup>. It leads to poor lung compliance, hypoxemia leading to respiratory distress with complications like respiratory failure, pulmonary air leaks and persistent pulmonary hypertension of the newborn. One-third of infants require intubation and mechanical ventilation<sup>3,4</sup> and newer neonatal therapies like high frequency ventilation, inhaled Nitric Oxide and surfactant administration<sup>5,6</sup>. The incidence of MAS, morbidity and mortality varies among countries. 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. There is paucity of data regarding the neonatal outcome of babies born through MSAF in Nepal. This study is aimed to assess the perinatal attributes, mortality and morbidity 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 especially at the regional level II/III perinatal centre.

## Materials and Methods

All live babies born through MSAF over duration of three months from April 2010 to June 2010 were enrolled. This was a cross-sectional study. To assess the risk factors related with MSAF deliveries and MAS all the details regarding mode of delivery, APGAR score (AS), birth weight, fetal distress, birth asphyxia, maternal age, any maternal illness and parity, time of rupture of membranes, gestational age, chest radiograph findings, clinical course, outcome and mechanical ventilation (MV) as needed were recorded and evaluated. Newborns with gross congenital anomalies were excluded. Risk estimation analysis for MAS was done by calculating Odd's Ratio (OR) and Bivariate Analysis.

## Results

There were total 5641 live births over a period of three months. Out of these deliveries 824 babies were born through MSAF which estimates to be 14.6%. Owing to the lack of complete data 27 babies were excluded. Among 797 babies born through MSAF, 53 developed MAS i.e.6.6%. Table 1 show different variables studied as risk factors for MAS. Among all the variables APGAR score at 1 minute and 5 minute, premature rupture of membranes (PROM) and need of mechanical ventilation were significant variables associated with increased risk of MAS in the babies born through MSAF by Chi-square test. Table 2 shows the bivariate analysis further done that revealed APGAR score at 1 minute and 5 minute, need of resuscitation and PROM as significant factors contributing to increased incidence of MAS. The clinical outcome is shown in Table 3. Neonates born through meconium stained liquor were diagnosed and categorized as shown in Table 4. Among the category of others, conditions like congenital heart diseases, intrauterine pneumonia, neonatal depression and suspected case of spinal muscular atrophy were present.

## Discussion

In the study MSAF deliveries were 14.6% and out of all the neonates born through MSAF, 6.6% developed MAS. The occurrence of MSAF varied from 7.9% to 18%<sup>8, 9, 10, 12</sup> in other studies. The study done by Bhat RY<sup>11</sup> showed MAS occurred in 11.3% of babies born through MSAF while in other studies it varied from 1% to 38.5%<sup>8,9,10,12,13</sup>. Seventeen percent of the babies among MAS group required mechanical ventilation and three newborns were referred due to the ventilators being occupied. Among all the neonates born through MSAF 41.8% were born through normal vaginal delivery, 49.4% through caesarean section and 8.7% by assisted

delivery, vacuum being the commonest method. Out of all the babies who developed MAS 39.6% were born through normal vaginal delivery, 47.1% born through caesarean section and 13.2% through assisted vaginal delivery. Mode of delivery was not found to be a significant risk factor for MAS. Some of the studies<sup>12</sup> do not reflect caesarean delivery as the significant risk factor while other studies showed it as the significant risk factor for MAS<sup>7,14</sup>. 82% of the mother belonged to the age group of 20 to 34 years and those mothers who developed MAS 83% were in the age group of 20 to 34 years. Age of the mother, parity and birth weight of babies did not show significant association with MAS similar to other authors<sup>12,14</sup> while few studies showed the association for the parity<sup>9,15</sup>. Although there was increased incidence of MSAF and MAS in the post dated group between 40 to 42 weeks but the gestation was not significantly associated with increased incidence of MAS as seen in other studies<sup>7,14</sup>. The number of post term pregnancy was quite less as compared to other gestational groups probably our hospital being a tertiary hospital and intervention is done timely before the pregnancy could reach post term. Fischer C et al<sup>14</sup> found in their study gestational age as main risk factor of MAS but the incidence of MAS in neonates born through MSAF did not depend on gestational age.

Bivariate analysis showed APGAR score at 1 minute, 5 minute, PROM and need of resuscitation as significant factors contributing to increased incidence of MAS. Peter AD<sup>7</sup> found in Australian live births a very strong association with a 5 minute APGAR score <7 with an overall Odd's ratio of 52. Similar observation was made by Bhat RY, Liu WF in their study where they found APGAR score at 1 minute and 3 minutes as significant but they took APGAR score value at 1 minute as 6 and at 3 minute as 7 respectively. In another study<sup>12</sup> APGAR score at 5 minute < or =5 was found to be significant. Meydlani MM et al<sup>15</sup> found APGAR score < or =6 at 5 minute (RR=3.8, 95% CI=1.7-8.4) as significant risk factor for MAS. Similarly others<sup>14,16</sup> have shown low APGAR score as main risk factor for MAS reflecting perinatal asphyxia as a significant risk factor. Those babies requiring resuscitation had significant association with MAS and so are reflected by low APGAR score at 1 and 3 minute. Low APGAR score and need of resuscitation signify the need of improvement in antenatal care and preventing perinatal asphyxia to prevent the morbidity and mortality associated with MAS. 30% to 50% cases of MAS may require mechanical ventilation or continuous positive airway pressure<sup>17</sup>. PROM was also a significant risk for the development of MAS. In the study done by Bhaskar SH et al<sup>9</sup> the incidence of MAS was significantly higher in mothers

with PROM. This observation reflects that monitoring and timely intervention is needed when there is history of ruptured membranes to prevent MAS. In our study mortality among those who developed MAS was 11.3%. The mortality reported in other studies<sup>7,11,13,18</sup> varied from 2.5% to 33%. The mortality was high especially

when compared to western data<sup>7</sup>. In a tertiary hospital where many obstetric cases were referred cases, along with the setting of limited resources, inappropriate ratio of patient to health personnel, and limited availability of technology, decreasing morbidity and mortality is a big challenge.

**Table 1:** Variables and their association with MAS among neonates born through MSAF

Variables		No MAS	MAS	Total	p-value
	<20	108	7	115	
Age Group (years)	20-34	613	44	657	0.898
	>34	23	2	25	
Sex	1	407	29	436	0.999
	2	337	24	361	
Birth weight (grams)	<2500	53	7	60	0.105
	>=2500	691	46	737	
AS 1 minute	<=3	38	27	65	<0.001
	>3	706	26	732	
AS 5minute	<=3	13	7	20	<0.001
	>3	731	46	777	
Mode of delivery	Normal	311	21	332	0.548
	Vacuum	65	7	72	
	Caesarean	368	25	393	
Asphyxia	Yes	37	33	70	<0.001
	No	707	20	727	
Fetal distress	MSAF	731	53	784	0.815
	MSAF with tachycardia	1	0	1	
	MSAF with bradycardia	11	0	11	
	Decreased fetal movements	1	0	1	
Resuscitation	Yes	30	28	58	<0.001
	No	714	25	739	
PROM	Yes	13	4	17	0.005
	No	731	49	780	
Maternal illness	Yes	34	5	39	0.113
	No	710	48	758	
Parity	Primi	448	33	480	0.225
	*G2-G4	279	16	293	
	>G4	18	3	20	
Gestational age (weeks)	>42	39	2	41	0.724
	37-40	220	13	233	
	40-42	429	32	461	
MV needed	Yes	2	9	11	<0.001
	No	742	44	786	

\*AS- APGAR score, G- Gravidarum, MSAF- Meconium stained amniotic fluid, MV- Mechanical ventilation

**Table 2:** Risk Factors with increased incidence of MAS by Bivariate analysis

	p-value	OR	95.0% C.I for OR	
			Lower	Upper
AS 1 minute	<0.001	19.29	10.28	36.22
AS 5 minute	<0.001	8.56	3.26	22.48
Resuscitation	<0.001	26.66	13.90	51.13
PROM	0.010	4.59	1.44	14.60

\*AS- APGAR score, PROM- Premature rupture of membrane

**Table 3:** Outcome of Neonates born through Meconium Stained Amniotic Fluid

Clinical outcome	No MAS	MAS	Total
Well baby	693	0	693
Improved & discharged	45	47	92
Expired	3	6	9
Referred	3	0	3
<b>Total</b>	<b>744</b>	<b>53</b>	<b>797</b>

**Table 4:** Final Diagnosis of Neonates born through Meconium Stained Amniotic Fluid

Outcome	Frequency	Percent
MAS	20	2.50
Perinatal Asphyxia	14	1.76
Perinatal Asphyxia with MAS	32	4.02
MAS with Sepsis	1	0.12
Septicemia	1	0.12
Born through MSAF without any complications	718	90.1
Others	11	1.38
<b>Total</b>	<b>797</b>	<b>100</b>

## Conclusion

Among all the risk factors evaluated perinatal asphyxia and PROM were identified as significant in development of MAS in the neonates born through MSAF. The mortality is also high reflecting the need of improvement in the management of neonatal care at the tertiary level especially in the hospital where the number of high risk deliveries is more. Preventing perinatal asphyxia through appropriate monitoring and timely delivery will be the main key to prevent MAS. When history of PROM is present timely management is needed to prevent MAS and its sequelae as shown by the study.

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