

## Perinatal outcome in meconium stained liquor in labour

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### Abstract

Meconium staining of amniotic fluid during labor has been implicated as a factor influencing fetal wellbeing during intrapartum and post partum period

**Aim:** To evaluate the perinatal outcome in terms fetal outcome, mode of delivery in patients with meconium stained liquor during labor

**Materials and Methods:** This was a retrospective and prospective observational study under taken at Sri Rama Chandra Medical College, Porur, Chennai. The study period was from 2014-2016 constituting 250 patients.

**Results:** out of 250 patients 25.2 % of them had abnormal CTG, which was significantly associated with mode of delivery and neonatal outcome where increased incidence of cesarean section and neonatal mortality and morbidity

The major causes of neonatal morbidity in our study were 20.8% -jaundice, 7.6% asphyxia, 5 % meconium aspiration, 1.6% sepsis, 8% pneumonia, 4% hypoxic encephalopathy and there was one neonatal death due to meconium aspiration syndrome

**Conclusion:** when meconium stained liquor is associated with abnormal fetal heart rate pattern, it should be taken as potential danger sign for the fetus and early intervention is required.

Neonates with meconium aspiration syndrome and birth asphyxia are to be closely monitored and vigorously treated in NICU.

**Keywords:** Meconium stained liquor, Birth asphyxia, Meconium aspiration syndrome.

### Introduction

Amniotic fluid plays a major role in fetal growth and development. It provides the fetus with a protective low resistance environment suitable for growth and development.

One of the abnormalities of amniotic fluid is meconium stained fluid. Incidence of meconium stained fluid is approximately 10% of all pregnancies. 35% of these meconium is aspirated in to fetal lung and 10-40% of the asphyxiated babies who aspirate die neonatally.

There are various theories proposed by different authors, desmond (1957)<sup>1</sup> postulated that hypoxia stimulates vagal reflex which leads to relaxation of anal sphincter and meconium passage. Miller et al<sup>2</sup> after extensive work concluded the etiology of meconium passage may be due to physiological due to spontaneous gastro intestinal tract motility, or due to direct hypoxic bowel stimulation, or due to sporadic and repetitive cord compression causing vagal stimulation resulting in to hyper peristalsis of gut and relaxation of anal sphincter leading to meconium passage.

Many workers to assess the fetal condition and outcome depending on its color, consistency and time of appearance after rupture of membranes graded meconium stained amniotic fluid. When there is small amount diluted in a plenty full amount of amniotic fluid which gives slightly yellowish or greenish discoloration considered as grade 1.

When ever moderate amount of meconium stained amniotic fluid which gives khaki colour termed as grade -2.

Heavy staining wher ther is reduced amniotic fluid and large amount of meconium making staining thick which gives "peasoup" consistency (Demisev amenu sori 2016)<sup>3</sup>

Miller stated that presence of meconium in amniotic fluid without signs of asphyxia ie fetal heart rate abnormalities is not a sign of fetal distress.<sup>2</sup> Rosrio in 1996<sup>4</sup> in their study on fetal distress concluded that Fetal heart rate abnormalities dignosed on electronic monitor along with meconium stained amniotic fluid as assign of fetal hypoxia.

Gestational age has great influence on meconium stained amniotic fluid incidence of meconium stained amniotic fluid increases with increasing gestational age. Walker in observed that presence of meconium was more with increasing with increasing gestational age incidence raised from 2% in 38 weeks to 44% in 42 weeks. Studies done by ouladsahebmadarek(2012)<sup>5</sup>, demise amenu(2016)<sup>3</sup> concluded that meconium liquor were significantly associated among post dated pregnancies.

Desmond<sup>1</sup> concluded that diminished oxy gen transfer through placenta actually causes meconium in thin women with maternal high risk factors like post term pregnancy, oligohydramnios, IUGR, maternal hypertension, prolonged labor, induction of labor

### Meconium Aspiration Syndrome

Meconium aspiration remains the most significant cause of morbidity and mortality during neonatal period. Overall incidence of meconium aspiration in live born infants is 1 to 3%. Between 10 to 30% of meconium stained babies develop varying degrees of respiratory difficulties. The exact mechanism how

aspiration of meconium occurs is not known till now. Various hypotheses were put forwarded. Not all the fetuses with MSAF do aspirate a matter, which baffles the workers in the field. Inhalation of meconium-stained liquor at or near delivery causes acute airway obstruction, chemical pneumonitis, surface dysfunction or inactivation and pulmonary hypertension. (Swarnam,2012)<sup>6</sup> If severe, hypoxemia may lead to neonatal death or long-term neurological sequel in survivors.

In a French study of nearly 133000 term newborns, the prevalence of sever aspiration syndrome was 0.07% and this increased progressively from 37 to 43 weeks of gestation.<sup>7</sup>

This standard call has recently been questioned by several reports, which suggest that meconium aspiration is a predominantly intrauterine and intrapartum event. Meconium Aspiration syndrome is defined by the following criteria:

1. Presence of meconium below vocal cords.
2. Clinical respiratory distress in the first 24 hours of life.
3. Abnormal chest X-ray consistent with aspiration pneumonitis.

Fetus exhibits breathing like movements in utero, but it is generally stated that AF is normally swallowed and does not enter trachea, except during severe hypoxia, hence an episode of severe asphyxia is important in the production of MAS.

In the presence of hypoxia, plenty of meconium is passed and if it is associated with scanty AF, the mixture becomes really thick which when aspirated becomes dangerous.

About 13% of those infants born with MSAF show MAS. The neonatal mortality of MAS is 20%. (Meydanil 2001)<sup>8</sup>

Pathophysiology of meconium aspiration syndrome.

Meconium has definite toxic properties of a low grade nature, similar to those of bile, but is much more pronounced in their local effect. The pH of meconium ranges between 5.5-7.

### Diagnosis of MAS

MAS must be considered in any infant born through meconium stained liquor who develops symptoms of respiratory distress. The classic roentgenographic findings in MAS are described as diffuse asymmetric patchy infiltrates but because of the diverse mechanism that causes disease, various radiographic findings may be present. Frequently over aeration is present, which may lead to air leak syndromes, such as pneumothorax, pneumomediastinum or pulmonary interstitial emphysema.

Gefland et al 2004,<sup>9</sup> concluded that meconium seems to be toxic to the lungs in many ways and it may be difficult to determine which mechanisms

predominate at a given point of time. Mechanism of injury in MAS is as follows.

1. Mechanical airway obstruction.
2. Chemical pneumonitis with hemorrhagic pulmonary edema.
3. Vasoconstriction of pulmonary vessels with the development of persistent pulmonary hypertension
4. Surfactant inactivation leading to atelectasis

Pathogenetic pathway of intraamniotic infection due to meconium passage that results in a release of cytokines and eicosanoids from fetal lungs which can damage myelinogenesis and lead to periventricular ischemia and leukomalacia, in comparison with normal neural development in an infant born through clear amniotic fluid without meconium aspiration syndrome.

### Management of Meconium Aspiration Syndrome

Ventilator support is given as needed. Because some aspects of meconium aspiration syndrome are caused by surfactant deficiency, replacement therapy has been given in some studies. Extracorporeal membrane oxygenation-ECMO therapy is reserved for neonates who remain poorly oxygenated despite maximal ventilator assistance. In their Cochrane review of randomized trials, El Shahed and colleagues 2007<sup>10</sup> found that surfactant replacement significantly decreased need for extra-corporeal membrane oxygenation. Although they found that surfactant administration did not lower the mortality rate, a subsequent trial suggested that it was reduced. The proportion that requires ECMO treatment varies. In the report by Singh and coworkers 2009<sup>11</sup>, 1.4% of 7518 term newborns with the syndrome required such treatment, and these had a 5% mortality rate. Ramachandrapa and colleagues 2011<sup>12</sup> reported a higher mortality rate in late pre-term infants compared with term infants. Finally, pulmonary lavage with surfactant is being evacuated.

Zidaeh 2000<sup>13</sup> found meconium staining of AF significantly associated with poor neonatal outcome, perinatal mortality increased from 2 per 1000 birth with clear AF to 10 per 1000 with stained AF. Severe fetal academia, MAS, delivery by CS 7-14% also increased with MSAF. It is concluded that meconium in AF associated with an obstetric hazard significantly increased risk of adverse neonatal outcome.

### Materials and Methods

This was a retrospective and prospective observational study under taken at Sri Rama Chandra Medical College, Porur, Chennai.

The study period was from 2014-2016 constituting 250 patients.

1. Women in concordance with the inclusion criteria –(All live singleton pregnant women of more than 37 weeks with cephalic presentation in labour at Department of OBG at Sri Ramachandra University with meconium stained fluid) are

selected. Mothers in labour were excluded from study with following criteria (antepartum hemorrhage, congenital malformation, preterm delivery, intrauterine death, Non cephalic presentations).

2. Data regarding the antepartum, intrapartum and periods are obtained through history, examination, investigations and written documents.
3. Perinatal Outcome: mode of delivery, type of delivery, maternal risk factors.
4. Neonatal Outcome: Birth weight, APGAR scores, admission to NICU, Neonatal complications.
5. Study cases were grouped in to 3 categories according to clinical gradation below

Grade -1 thin meconium at time of rupture of membranes or in course of labour.

Grade -2 moderately meconium stained at time of rupture of membranes orl in course of labour.

Grade -3 thick meconium stained at time of rupture of membranes or in course of labour.

Clinical fetal monitoring ie: fetal heart rate monitoring was also noted at the time of collecting the meconium stained amniotic fluid.

## Observation and Results

**Table 1: Incidence of meconium stained amniotic fluid with clinical grading**

N-250	Grade-I	Grade-II	Grade-III	Total
	49 19.6%	94 37.6%	107 42.8%	250

Among 250 cases Incidence of grade 3 meconium stained amniotic fluid was more constituting of 42.8% and grade consisting of 37.6%

**Table 2: Correlation of gestational age of fetus with meconium stained liquor**

Gestational age group in weeks	No of cases	Percentage
37-39 weeks and 6 days	109	43.6%
40-42 weeks	141	56.4%

Increased incidence of meconium stained amniotic fluid was seen beyond 40 weeks of gestational age constituting 56.4% with a mean gestational age of 41 weeks.

Potential antepartum and intrapartum risk factors with meconium stained liquor.

Maternal antepartum and intrapartum risk factors in cases of meconium stained amniotic fluid included oligohydramnios, Hypertension, anaemia, IUGR, Prolonged labour. More than one risk factor was seen in 10 cases. Cases with crossed dates had increased incidence of meconium stained amniotic fluid.

The risks such as oligohydramnios, prolonged labour and Hypertension prevailed more compared to other things and had statistically significant association with meconium stained amniotic fluid.

Correlation of mode of onset of labour with meconium stained liquor was observed in between spontaneous and induced labor.

Incidence of meconium stained liquor was seen in induced group -56.8% among them grade 2 and 3 had

increased incidence was observed in patients with meconium stained liquor found that Increased incidence of operative delivery (LSCS) seen with increasing grade of meconium stained liquor with 15.6% in grade-2 and 36.8% in grade-3 which was stastically significant.

**Table 3: Mode of delivery**

Grades	NVD	AVD	LSCS
Grade-1	37-14.8%	2-0.8%	10-4%
Grade-2	45-18%	10-4%	39-15.6%
Grade-3	11-4.4%	4-1.6%	92-36.8%
Total	93-37.2%	16-6.4%	141-56.4%

Correlation of CTG with meconium stained liquor (Table 4) was observed 62.4% patients had non-reassuring CTG with cocsistency of MSL which had a significant correlation in deciding the mode of delivery and neonatal outcome and this data was stastically significant.

**Table 4: Correlation of CTG with meconium stained liquor**

Grades	Reassuring	Non-reassuring
Grade-1	39-15.6%	10-4%
Grade-2	50-20%	44-17.6%
Grade-3	5-2%	102-40.8%
Total	94-37.6%	156-62.4%

When we correlate the APGAR score with meconium stained amniotic fluid (Table 5)

**Table 5: Correlation of APGAR score with meconium stained amniotic fluid**

	1 Minute APGAR		5 Minute APGAR	
	<7	>7	<7	>7
Grade-1	6	43	2	47

Grade-2	22	72	2	92
Grade-3	34	73	14	94
Total	62-24.8%	188-75.2%	18-7.2%	233-93.2%

Found that 7.2 % of babies had low APGAR which was associated with poor outcome and neonatal morbidity and this was stastically significant.

Frequency of NICU care and stay in fetus born with meconium (Table 6) observed as 13 cases required more than 7 days of NICU care out of which 9 cases are grade 3 MSL and 5 cases from grade 2 msl

**Table 6: Frequency of NICU care and stay**

Days	1-3	4-6	>7	Total
Grade-1	46	2	1	49-19.6%
Grade-2	83	10	5	94-37.6%
Grade-3	85	13	9	107-42.8%
Total	219-87.6%	25-10%	15-6%	250

Different causes of neonatal morbidity in MSL (Table 7) observed were asphyxia, Meconium aspiration

syndrome, pneumonia, sepsis, hypoxic ischemic encephalopathy

**Table 7: Different causes of neonatal morbidity in MSL**

Grades	Asphyxia	MAS	Pneumonia	SEPSIS	HIE
Grade-1	2-1%	4-2%	0	0	0
Grade-2	8-4%	2-1%	0	2	0
Grade-3	9-4.5%	4-2%	2-1%	2-1%	1-0.5%
Total	19-9.5%	10-5%	2-1%	4-2%	1-.5%

Meconium stained liquor is associated with increased neonatal morbidity which is seen more among grade 2 and grade 3 MSL

Fetal outcome in meconium stained liquor out of 250 cases 1 baby died due to meconium aspiration syndrome ON D2 of life

## Discussion

Meconium stained amniotic fluid is implicated as a factor influencing fetal well being during intra partum and postpartum period.in our present day to day practice the presence of meconium in amniotic fluid warrants close monitoring fetal well being.in this present study 250 patients with meconium were included and were divided into three groups according to grading of meconium as grade 1,2,3 meconium.

In 2013 Meena<sup>14</sup> studied 250 patients with meconium found that grade -1 msl -34.5%, grade -2 msl-40.8%, grade -3 msl 24.8% and analysed the various causes and perinatal outcome.

In the present study grade -1 msl 19.6%, grade -2msl 37.6%, grade -3msl 42.8%.

## Gestational Age

As noted from table -2 incidence of MSAF in present study was beyond 40 weeks of GA constituting 56.4% with mean gestational age of 41 weeks and 43.6% noted among 37-39 weeks.

Naveen et al<sup>15</sup> noted that increased incidence of MSAF was noted beyond 40 weeks. Recent study done by Monohar et al (2013) showed increased incidence in post dated babies.

## Maternal Risk Factors

In the present study the following risk factors were noted with 24% of prolonged labor, 9.6% of oligohydramnios, 5.6% iugr,6.4% anemia,6% hypertension.

In study done by shankyan et al <sup>16</sup> association of prolonged labor with meconium was 20% in present study it was 24% Debas et al association of meconium and IUGR was 13.07%, in our study it was 6.4%

Devang desai<sup>17</sup> observed that oligohydramnios was seen 4% of patients with meconium and in present study it was 9.6%. PIH was associated with meconium in 11.2% of patients in study done by Usha Krishna, in our study it was seen in6% of patients.

## Mode of Delivery

In present study increased cesarean section rates were seen among grade 2and 3 msl with15.6%and 36.8% which was stastically significant. In study done by Meenakumari cesarean rate was 42.4% and it was 49.1% in Naveens et al study.

Meconium and abnormal CTG (fetal heart rate) patterns.

In present study the abnormal fetal heart pattern was .8 % in grade -1, 7.6 % grade -2, 16.8% in grade -3. In study done by Meena<sup>15</sup> it was 10.4%, 18.6%, 35.4% respectively.

Significant association MSAF and abnormal CTG was seen in grade 3msl.

### MSAF and poor APGAR

In present study 11.6 % patients with grade 3 meconium had poor APGAR less than 7. Lokesh et al in<sup>18</sup> in 2013 observed that poor APGAR significantly associated with increased incidence of MAS and poor perinatal outcome.

### Requirement of NICU Care

Our present study patients with MSAF and all babies born to MSAF mothers were admitted in NICU as routine. Out of which 35.2% of babies had complications like HIE, MAS, sepsis, pneumonia, birth asphyxia. Longer duration of NICU stay was significantly associated with poor apgar and increasing grade of MSL meconium aspiration syndrome.

In our study 5% of babies developed MAS out of which 1 neonatal death was present and belonged to grade 2 and 3 MSL. ESPHINHERA ET AL (2011)<sup>19</sup> showed that the incidence of MAS of about 5% and study done by ROSSI ET AL was 19%, 20% in study done by JOTHY et al.<sup>20</sup>

Causes of neonatal morbidity in our study were 20.8% -jaundice, 7.6% asphyxia, 5 % meconium aspiration, 1.6% sepsis, .8% pneumonia, 4% hypoxic encephalopathy and there was one neonatal death due to meconium aspiration syndrome.

### Conclusion

1. About 87% of babies remained asymptomatic in spite of MSL and required only routine care.
2. The incidence of meconium stained amniotic fluid greatly varies with maternal antenatal and intrapartum risk factors. Increased incidence was seen in cases with crossed dates. Prolonged labour, oligohydramnios and hypertension prevailed more compared to other factors and had a significant association with meconium stained liquor,  $P < 0.05$ .
3. As per the mode of delivery concerned, increased incidence of cesarean section was seen and was significantly associated with the consistency of meconium.
4. Meconium stained amniotic fluid is significantly associated with abnormal foetal heart rate ( $P < 0.05$ ), should be taken as a potential danger sign for the baby and the need for early intervention is required.
5. Neonates with thick meconium, as compared to those with thin meconium appeared to have significantly greater rates of acidemia, low APGAR score at 1 min and 5 min ( $P < 0.05$ ), more

need for resuscitation and increased rate of NICU admission.

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