

## Original Research Article

# An observational study of meconium aspiration syndrome and its immediate outcome with relation to thick and thin meconium stained amniotic fluid

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**Received:** 19 December 2017

**Accepted:** 25 January 2018

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### ABSTRACT

**Background:** Meconium-stained amniotic fluid (MSAF) accounts for approximately 10-15% of live births and Meconium aspiration syndrome occurs in 5% among infants born through MSAF. The purpose of this study was to evaluate the outcome in neonates with meconium aspiration syndrome with regard to thin and thick meconium.

**Methods:** A prospective cohort study of inborn neonates was done from April 2016 to August 2017 admitted in neonatal intensive care unit, Department of Paediatrics and Neonatology, RIMS, Ranchi after obtaining written informed consent from the parents or guardian and diagnosis of MAS was made depending on the clinical criteria and its clinical outcome was observed. MAS babies were studied on the basis of thin and thick meconium stained amniotic fluid.

**Results:** The mean birth weight in thin meconium was  $2760 \pm 394$ . The mean APGAR score in thin meconium at 1 minute ( $3.57 \pm 1.01$ ) and 5 minutes ( $5.57 \pm 1.62$ ) was significantly more than thick meconium. The mode of delivery in thin meconium was commonly by cesarean section (76.9%). There was need for resuscitation in 46.1% in thin meconium neonates which was significantly higher than neonates born with thick meconium 6.6% (P value 0.000). The most common complication in thin meconium was birth asphyxia (69.2%), followed by ARF and septicemia. Death was significantly higher in neonates born with thin meconium (69.2%) as compared to thick (20%) with P value of 0.000

**Conclusions:** Amniotic fluid with thin meconium may cause more respiratory and other complications in neonates than amniotic fluid with thick meconium. Hence proper diagnosis and timely intervention can reduce the morbidity and mortality in neonates with meconium aspiration syndrome.

**Keywords:** Birth asphyxia, HIE, Meconium aspiration syndrome, Mortality, Neonatal ventilation, Pneumothoraces

### INTRODUCTION

Meconium-stained amniotic fluid (MSAF) accounts for approximately 10-15% of live births and Meconium aspiration syndrome occurs in 5% among infants born through MSAF. It has been considered that Meconium staining of amniotic fluid is a predictor of poor fetal outcome because of its association to fetal distress and

risk of aspiration of meconium.<sup>1</sup> In utero, there is rare passage of meconium before 32 weeks of gestation and most babies with meconium stained amniotic fluid are more than 37 weeks<sup>2</sup>

The MSAF Incidence increases further, and approximately 30% of new-borns born after 42 weeks of gestation have MSAF. An increase incidence of MSAF

is noted in presence of fetomaternal stress factor such as hypoxia and infection, independent of fetal maturation. With advancing gestational age the increased incidence of MSAF reflects the maturation of peristalsis in the fetal intestine.<sup>3</sup> MAS is described as development of respiratory distress soon after birth with radiological evidence of aspiration pneumonitis in the presence of meconium staining of liquor, staining of nails, staining of umbilical cord or skin.<sup>3</sup>

In recent years adopting the suggestion by Carson et al and Linder et al vigorous infants born with thin and thick meconium do not require tracheal intubation and suction. However, infants with poor tone and respiratory effort or apnea continue to be managed by attempted tracheal suctioning. Passage of meconium was significantly associated with severe asphyxia and carried a bad prognosis with increased risk of development of meconium aspiration syndrome, hypoxic ischemic encephalopathy, seizures and pulmonary air leak syndrome.<sup>4</sup>

The purpose of this study was to evaluate neonates with meconium aspiration syndrome and to see whether pulmonary disease and mortality were significantly greater in infants with thin meconium. The primary objective was distribution and evaluation of the outcome in neonates with meconium aspiration syndrome. Secondary objectives were distribution of route of delivery, need for resuscitation, Apgar score at 1 and 5 minutes, gestational age, birth weight, gender, complications and treatment in both the groups.

## METHODS

A total of 56 inborn neonates with meconium aspiration syndrome admitted in neonatal intensive care unit of Department of Pediatrics and Neonatology, RIMS, Ranchi from April 2016 to August 2017 after obtaining written informed consent from the parents or guardian.

### Inclusion criteria

All preterm, term and post term neonates with meconium aspiration syndrome having following features:

- History of Meconium stained amniotic fluid
- Tachypnea, retraction, grunting or other abnormal sign on physical examination consistent with respiratory distress, within 24 hours of life
- Need for supplemental oxygen
- An abnormal chest X-ray consistent with aspiration pneumonitis.

### Exclusion criteria

- Neonates with meconium stained amniotic fluid but without any respiratory distress or chest X-ray finding not consistent with aspiration pneumonitis

- Neonates with TTNB, HMD, congenital pneumonia, sepsis
- Neonates who will get LAMA
- Non-availability of complete data.

During delivery, the type of delivery and any complications in the mother were recorded and resuscitative measures done were suctioning of the oropharynx by paediatrician after delivery of head.

When required, endotracheal intubation was done, and bag and tube ventilation was given. If vigorous neonate was placed with mother and was provided routine care as per NRP guidelines.

Stomach wash was given to prevent further vomiting and aspiration of meconium stained fluid from stomach.

After detailed antenatal, natal and post-natal clinical history, following Investigations were done:

- Complete blood count (Haemoglobin, RBC count, Total leucocyte count, differential leucocyte count, platelets count, PCV) and peripheral blood smear.
- Band cell count, micro ESR, C-Reactive protein (CRP) and blood culture
- Arterial blood gas (ABG) analysis
- Blood urea
- Serum creatinine
- Serum calcium estimation
- Random blood glucose level estimation
- Chest X-ray AP view
- Echocardiography.

### Statistical analysis

The results of analysis are depicted in Tables. Wherever applicable statistical significance was evaluated by 'p' value <0.05. The entire statistical analysis was done with the help of Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi in Microsoft Excel using Software Graph-pad Prism ver 6.0 and Graph-pad Instant software.

## RESULTS

The present study was a prospective study conducted over a period of one year four months from April 2016 to August 2017 in Neonatal Intensive care unit (NICU) of Department of Paediatrics and Neonatology, Rajendra Institute of Medical Sciences, Ranchi.

During the study period of 1 year 4 months (April 2016 to August 2017), out of 5384 deliveries, 588 (11.2%) neonates had meconium stained liquor and out of these 588 neonates, 56 (9.6%) neonates developed MAS. The total number of neonates having respiratory distress was 387.

### Primary outcome

The study reveals that among 56 cases of MAS, majority were of thick meconium type (n = 30, 53.5%) than thin meconium type (n = 26, 46.4%) (Table 1).

**Table 1: Distribution of type of meconium in MAS.**

Meconium type	Total no. of cases	% of total cases
Thin	26	46.4
Thick	30	53.7

**Table 2: Comparison/statistical analysis of different parameters of neonates having MAS with thin and thick meconium.**

	Thin Meconium (n=26)	Thick Meconium (n=30)	P value
<b>Route of delivery</b>			
Vaginal	5	4	0.838
Cesarean	20	19	
Assisted delivery	5	3	
<b>Need for resuscitation*</b>	12	2	0.000
<b>Apgar Score at 1 min and 5 min</b>			
1-minute Apgar score*	3.57±1.01	4.9±1.15	0.000
5-minute Apgar score*	5.57±1.62	7.4±1.4	0.000
<b>Gestational age</b>	39.04±2.4	38.8±2.6	
SGA	6	2	0.835
LGA	4	1	
<b>Birth weight (gram)</b>	2760±394	2728±423	0.636
<b>Gender</b>			
Male	16	13	0.173
Female	10	17	
<b>Complications</b>			
Birth asphyxia	18	16	0.224
ARF*	11	3	0.005
Septicaemia	11	7	0.129
Pneumonia	4	6	0.652
<b>Treatment</b>			
Oxygen*	9	21	0.0493
O <sub>2</sub> +CPAP*	5	3	
O <sub>2</sub> +CPAP+Vent*	17	9	
<b>Outcome</b>			
Death*	18	6	0.000
Discharge*	8	24	

SGA: Small for gestational age; LGA: Large for gestational age; O<sub>2</sub>: Oxygen; \*P value <0.05 (significant)

Patients in both thin and thick meconium were comparable with respect to route of delivery, need for resuscitation, Apgar score at 1 and 5 minutes, gestational

age, birth weight, gender, complications, treatment and outcome (Table 2).<sup>12</sup> Death was significantly higher in neonates born with thin meconium (n = 18, 69.2%) as compared to thick (n = 6, 20%) with P value of 0.000 (Table 2).

### Secondary outcome

On Comparing based on statistical analysis of different parameters of neonates having MAS with thin and thick meconium. The mean birth weight in thin meconium was 2760±394 whereas in thick it was 2728±423. 16 males neonates born with thin meconium and 13 with thick meconium and 10 females born with thin meconium and 17 with thick meconium (P value 0.173)

The mode of delivery in thin meconium was commonly by cesarean section 20 (76.9%) which was followed by vaginal 5 (19.2%) and assisted delivery 5 (19.2%) and in thick meconium was 19 (63.3%) followed by vaginal delivery of 4 (13.3%) and assisted delivery 3 (10%). There was need for resuscitation in 12 cases (46.1%) in thin meconium neonates which was significantly higher than neonates born with thick meconium 2 (6.6) with a P value of 0.000. The mean APGAR score at 1 minute and 5 minutes in thin meconium was 3.57±1.01 and 5.57±1.62 whereas in thick meconium it was 4.9±1.15 and 7.4±1.4.<sup>12</sup> The results were highly significant (P value 0.000). The mean gestational age of neonates with thin meconium was 39.04±2.4 and neonates with thick meconium was 38.8±2.6.

The neonates which were born small for gestational age were 6 for thin meconium and 2 for thick meconium whereas large for gestational age neonates were 4 for thin meconium and 1 for thick meconium (P value 0.835). The most common complication in thin meconium was birth asphyxia (n = 18, 69.2%), followed by ARF and septicaemia. In thick meconium also, birth asphyxia was most common (n = 16, 53.3%), followed by septicemia (n = 7, 23.3%) and pneumonia (n = 6, 20%). Majority of neonates born with thin meconium were mechanically ventilated (17), 9 neonates were managed only by oxygen treatment and 5 required additional CPAP. Among neonates born with thick meconium majority required only oxygen (21) and 9 were mechanically ventilated. The findings were statistically significant with P value of 0.0493 (Table 2).

## DISCUSSION

### Distribution of type of meconium in MAS

The study reveals that among total no. of cases of Meconium aspiration syndrome (56), majority of neonates were born with thick meconium (n = 30, 53.5%) than thin meconium (n = 26, 46.4%) (Table 1). This finding was more supported by Rossi where he studied of 73% of neonates having MAS presented with thick meconium.<sup>5</sup> Narang et al, found 44% neonates having

thick meconium and 56 %having thin meconium which was found very similar to the present study.<sup>4</sup> Fischer et al<sup>6</sup> 2012 found only 11.2% of neonates with MAS presented with thick meconium. Tayade S et al also found similar result of 36.66% of neonates having MAS presented with thick meconium.<sup>7</sup>

#### **Comparision/statistical analysis of different parameters of neonates having MAS with thin and thick meconium**

The mean birth weight in thin meconium is 2760±394 whereas in thick it was 2728±423. The mean APGAR score at 1 minute and 5 minutes in thin meconium was 3.57±1.01 and 5.57±1.62 whereas in thick meconium it was 4.9±1.15 and 7.4±1.4. The P value was 0.000. The mode of delivery in thin meconium was most commonly by cesarean section 20 (76.9%) which was followed by vaginal and assisted delivery 5 (16.6%) and in thick meconium was 19 (73.07%) followed by vaginal delivery of 4 (13.3%) and assisted delivery 3 (10%). There was need for resuscitation in 12 cases (46.1%) in thin meconium patients whereas only 2 (6.6%) in thick meconium patients with a significant P value of 0.000.

The most common complication in thick meconium was birth asphyxia (n = 18), followed by ARF and septicaemia. In thick meconium birth asphyxia was most common (n = 16), followed by septicaemia (n = 7) and pneumonia (n = 6). Death was significantly common in neonates born with thick meconium (n = 18,69.2%) as compared to thick (n = 6,20%) with P value of 0.000. Regarding the relationship of consistency of meconium and Apgar scores.<sup>12</sup> Thick meconium is usually regarded as a common finding in severe meconium aspiration syndrome (Alshuler et al, Dargaville et al, Kamala Swarnam et, Narang et al) and most studies were focused on neonates born through thick MSAF.<sup>8-10,4</sup> However, a lack of correlation between the severity of MAS and the thickness of meconium has been previously suggested by Ghidini and Spong et al (severe MAS may not be in fact causally related to the aspiration of meconium but rather caused by other pathologic processes occurring in utero, such as chronic asphyxia, infection, or persistent pulmonary hypertension).<sup>11</sup>

Present study shows thick meconium in 53.5% of severe MAS while thin meconium concern 46.4% of severe MAS respectively. The 5-minute APGAR score of <7 has traditionally been used as an indicator of the degree of asphyxial insult (Dargaville et al).<sup>12,9</sup> New-borns with thick meconium had significantly lower Apgar scores at 1 minute while neonates with thin meconium had no increased risk (Cloherty 7<sup>th</sup> ed).<sup>12,2</sup> That means, it can be inferred that thick meconium as a single variable is the most significant factor affecting the fetal outcome. In this study, 1-minute Apgar scores were investigated as a measure of neonatal outcome. It is found that, compared to the group of infants with thick meconium, significant numbers of cases in the group of infants with thin meconium had lower Apgar scores at 1 minutes and 5

minutes with P value of 0.000. The incidence of birth asphyxia is higher among neonates born with thin meconium (69.2%) than thick meconium (20%).

Also, present study shows there is significant neonates developing acute respiratory failure with thin meconium. Neonates with thin meconium have higher incidence of septicemia but pneumonia is more common in neonates with thick meconium. The neonates with thin neonates required more ventilator support 17 (65%) which was significantly more than thick meconium 9 (30%). Thick meconium babies were mostly managed conservatively, and thin meconium required additional CPAP and ventilator support. The outcome of thin meconium was worse with a significant mortality of 69.2 % than against 20% among thick neonates having P value of 0.0002 which is contrary to the previous studies.

#### **CONCLUSION**

Meconium aspiration syndrome constitutes an important contributor to hospital based neonatal mortality. Babies having born with thin meconium had a relatively poorer outcome than thick meconium and also need for resuscitation was also significantly more. Also, babies of meconium aspiration syndrome with thin meconium had more cases of acute respiratory failure, severe birth asphyxia and needing mechanical ventilation within 1st hour of life, had very poor outcome. The presently reported mortality figures are much higher, thus there is need for improved antenatal services and better ventilator management strategies.

Hence proper diagnosis and timely intervention can reduce the morbidity and mortality in meconium aspiration syndrome. A similar study on a larger sample size will give a definite correlation of various factors associated with MAS and its outcome.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Kumar S, Akhouri MR. An observational study of meconium aspiration syndrome and its immediate outcome with relation to thick and thin meconium stained amniotic fluid. *Int J Contemp Pediatr* 2018;5:552-6.