

## Original Research Article

# Clinical outcome of babies born through meconium stained liquor

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**Received:** 22 September 2023

**Revised:** 12 October 2023

**Accepted:** 13 October 2023

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## ABSTRACT

**Background:** Meconium aspiration syndrome (MAS) is as a result of aspiration of meconium-stained amniotic fluid antepartum or postpartum in term or near-term infants resulting in respiratory morbidity of varying severity. The present study was conducted to assess the clinical outcome of babies born through meconium stained liquor.

**Methods:** This is a prospective observational study of babies born through meconium stained liquor at ESIC Medical College and Post Graduate Institute of Medical Science and Research over a period of 18 months from March 2021 to August 2022.

**Results:** Majority of the babies were born through thin MSL. The highest incidence of MSL is seen in term babies. Normal vaginal delivery was the predominant mode of delivery. Thick MSL babies had low APGAR score at 1min. Majority of the thick MSL group had moderate to severe respiratory distress. Thick MSL babies required invasive mechanical ventilation compared to thin MSL group. Thick MSL study group had moderate to severe meconium aspiration syndrome compared to thin MSL study group. Perinatal depression was the most commonly associated complication in this study. Sepsis and PPHN were the complications that lead to mortality among the study group. Higher morbidity was seen in thick MSL group. The overall mortality was 1.6% and morbidity 55.2%.

**Conclusions:** Thick meconium stained amniotic fluid is associated with increased risk perinatal depression, persistent pulmonary hypertension, sepsis, severe meconium aspiration syndrome and mortality.

**Keywords:** Mechanical ventilation, Meconium, Respiratory distress

## INTRODUCTION

Meconium aspiration syndrome (MAS) is as a result of aspiration of meconium-stained amniotic fluid antepartum or postpartum in term or near-term infants resulting in respiratory morbidity of varying severity.<sup>1</sup>

MAS is defined as respiratory distress in a neonate born through meconium-stained liquor with characteristic radiological findings of hyperinflation and patchy opacities, whose symptoms cannot be explained otherwise.<sup>2</sup>

In utero passage of meconium leading to MSL complicates about 7-20% of all pregnancies worldwide, the incidence being higher in blacks and south Asian ethnicity.<sup>3,5</sup>

Meconium-stained liquor complicates approximately 10% to 15% of deliveries. However incidence of MSAF has decreased significantly in developed countries due to better perinatal care but remains high in developing countries. The incidence of MSAF in preterm infants is found to be very low. Most babies with MSAF are 37 weeks or older, and many meconium-stained infants are postmature or small for gestational age. Approximately

3% to 4% of neonates born through MSL develop meconium aspiration syndrome (MAS) in Western countries, but a higher incidence of around 11% to 28% is being reported in the developing world. Approximately 30% to 50% of these infants require respiratory support in the form of continuous positive airway pressure (CPAP) or mechanical ventilation.<sup>4</sup>

The incidence increases as the gestational age advances with reported frequencies at 37, 40, and >42 weeks being 3%, 13%, and 18% respectively.<sup>6</sup>

Apart from fetal maturation, various factors like maternal hypertension, oligohydramnios, maternal drug abuse (especially tobacco and cocaine), primigravidity, anemia, chorioamnionitis, prolonged labor, fetal distress, cord problems, and fetal growth retardation promote passage of meconium.<sup>7</sup> MAS is considered mild in infants requiring <40% oxygen for <48 hours without air leak. It is considered severe in infants who require assisted ventilation and/or CPAP and is often associated with PPHN.<sup>4</sup>

Meconium aspiration syndrome significantly presents with respiratory distress in first 24 hours of life and is assessed using Downe's score intensively every 4-6 hours as it would be very useful for evaluating the progress of respiratory distress. Downe's score <4 means no of respiratory distress, 4-7 shows presence of respiratory distress, while >7 shows threat of respiratory failure and need for mechanical ventilation.<sup>8</sup>

There is a significant disturbance of the pulmonary surfactant system in MAS; inhibition of surfactant function in the alveolar space is an important element of the pathophysiology of the disease. This inhibition may be mediated by meconium. The studies have showed that pulmonary surfactant therapy have reduced oxygenation index, increased arterial oxygen/alveolar oxygen ratio, shortened hospitalization days and decreased mortality rate significantly. Associated problem with MAS are persistent pulmonary hypertension of the newborn, hypotensive shock, myocardial dysfunction, hypoxic ischemic encephalopathy and renal dysfunction.<sup>9</sup>

Hence this study was undertaken to detect neonatal outcome in babies born through MSL in terms of mode of delivery, associated maternal complications, requirement of invasive ventilation, associated complications and factors leading to mortality. Aim of this study was to find outcome in neonates with meconium stained liquor in terms of morbidity and mortality.

## METHODS

Prospective observational study conducted in ESIC-MC&PGIMSR, Bangalore for period of 1.5 years (March 2021 to August 2022). Babies born through meconium stained liquor at ESIC Medical College and Post Graduate Institute of Medical Science and Research.

## Inclusion criteria

Babies born to singleton pregnancy with meconium-stained liquor irrespective of age, parity, presentation and stage of labor, requiring NICU admission were included in the study.

## Exclusion criteria

Babies with congenital malformations, multiple gestation, out born babies.

The subjects were consecutive neonates born through MSL in this hospital. Cases were included in this study keeping in mind the inclusion and exclusion criteria. Routine suctioning of all meconium stained infants was not recommended but in presence of significant fluid or secretions, the mouth and pharynx were aspirated with a bulb syringe after the delivery of head and before the breathing began. The vigorous neonates were treated as normal despite presence of meconium stained fluid.

In non vigorous infant, appropriate resuscitative measures were given. If the baby developed any complications, baby was shifted to NICU and managed according to standard protocols and outcome were noted in terms of morbidity and mortality. The study was conducted with obtaining ethical clearance from institutional ethics committee.

## Sample size estimation

Babies delivered through meconium stained liquor in this hospital during the study period will be a part of the study. Sample size was calculated based on previous study by Shilpashri et al in which it was observed that 11% of babies has meconium aspiration syndrome.<sup>10</sup> In the present study considering an expected proportion of 11% and absolute precision of 5.5% and confidence level of 95% minimum sample size required for present study was estimated to be 125 babies born through meconium stained amniotic fluid.

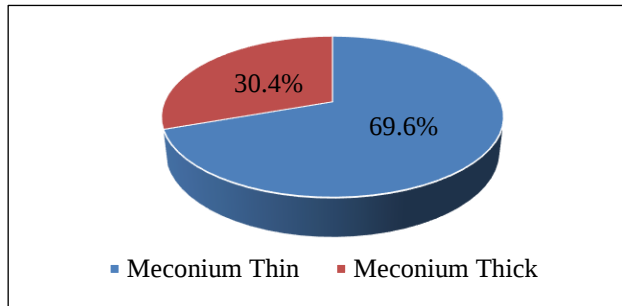
## Statistical analysis

All the data collected were entered into a Microsoft Excel worksheet and analyzed using the statistical software SPSS 20.0. The demographic characteristics were expressed in frequency with proportions and with suitable graphical representations. Based on the suitability of data chi-square test, fisher exact test, odds ratio with a confidence interval, and z-statistic is applied to find the statistically significant difference.

## RESULTS

Total 125 babies born through meconium-stained liquor in ESICMC PGIMSR Medical College during the study period fulfilling the inclusion criteria was enrolled in the study, out of which 87 babies were born through thin

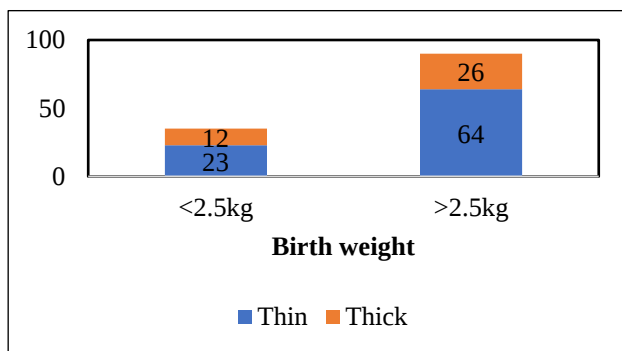
meconium-stained liquor and 38 babies born through thick stained liquor.



**Figure 1: Meconium status among the study group.**

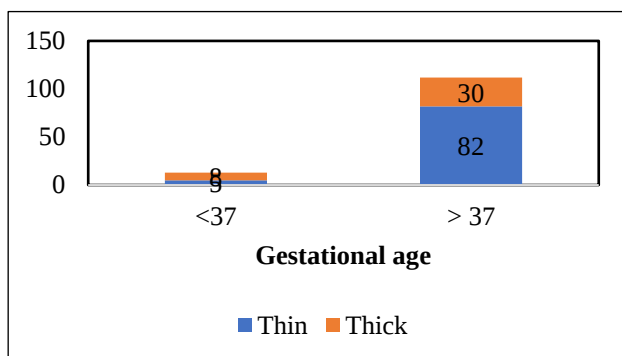
In the present study, 69.6% (87) had thin meconium and 30.4% (38) had thick meconium (Figure 1).

In the study, 28% (35) were low birth weight (<2.5kg) babies and 72% (90) were Normal weight (>2.5 kg) babies (Figure 2).



**Figure 2: Birth weight distribution among thin and thick meconium stained liquor study group.**

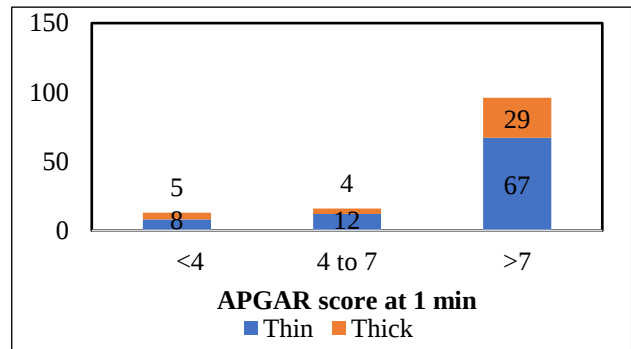
Among the babies born through thin MSL, 26.4% (23) were low birth weight and 73.6% (64) were normal weight, among babies born through thick MSL 31.6% (12) were low birth weight and 68.4% (26) were normal weight.



**Figure 3: Gestational age among thin and thick meconium-stained liquor study group.**

In the present study, 10.4% had gestational age <37weeks and 89.6% was born >37 weeks (Figure 3).

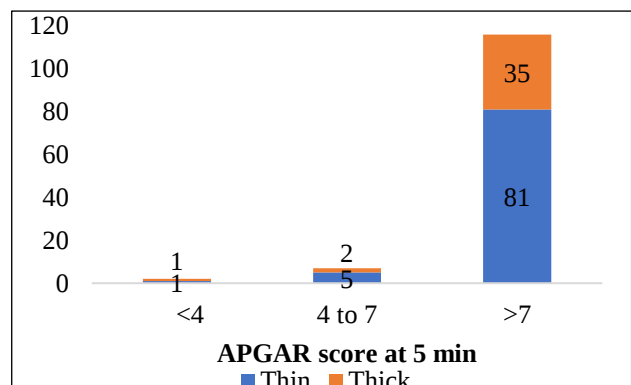
Among the thin MSL 5.74% (5) were <37weeks of gestation and 94.23% (82) were >37 weeks of gestation. Among the thick MSL 21.05% (8) were <37 weeks of gestation and 78.94% were >37 weeks of gestation.



**Figure 4: APGAR score at 1 min among thin and thick meconium-stained liquor study group.**

In the present study, 23.2% (29) babies had APGAR scores less than <7 and 76.8% (96) had score >7. 23% (9) in thick MSL group and 22% in thin MSL study group had APGAR score <7 at 1 minute (Figure 4).

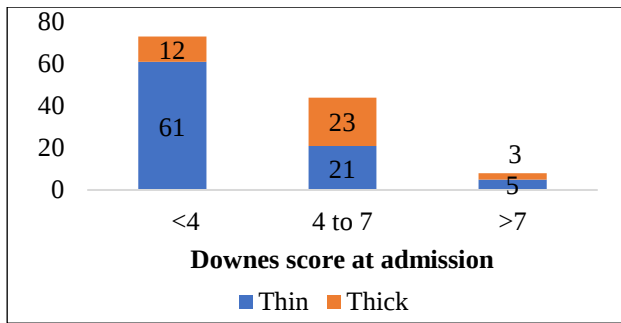
In the present study, 92.8% had APGAR score >7 at 5 minute. Among the study group, 7.8% (3) in thick MSL and 6.8% in thin MSL had APGAR score <7 at 5 min (Figure 5).



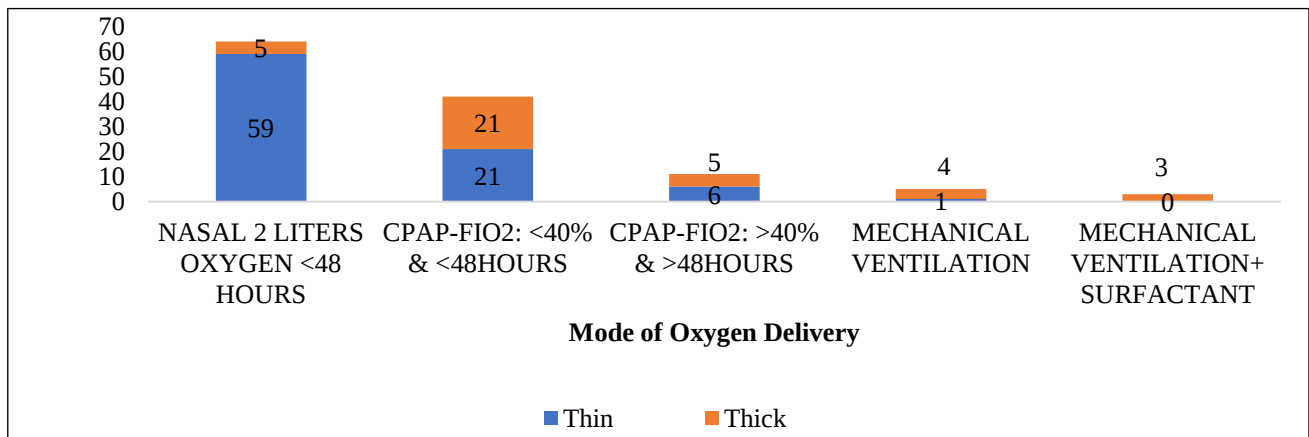
**Figure 5: APGAR score at 5 min among thin and thick meconium-stained liquor study group.**

In the present study, majority of the babies had DOWNES score <4. Among the study group, 68% in thick and 29.8% in thin MSL had DOWNES score>4 indicating moderate -severe distress (Figure 6).

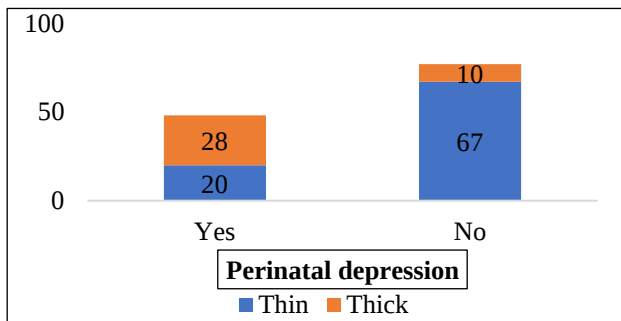
Among the study group, majority in thin (91.9%) and thick MSL (76.2%) group required non-invasive ventilation whereas 9.1% in thin MSL and 23.6% in thick group required invasive ventilation. In ventilated babies, 3 out of 16 babies received surfactant (Figure 7).



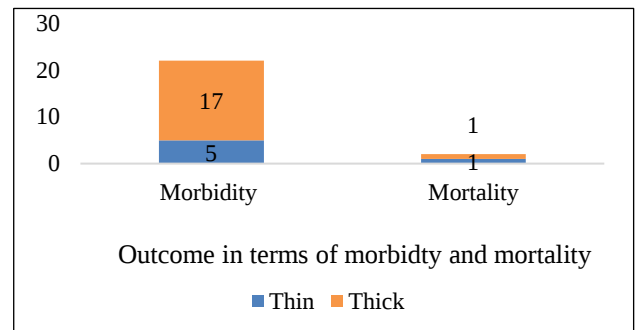
**Figure 6: DOWNES score at admission among thin and thick meconium stained liquor study group.**



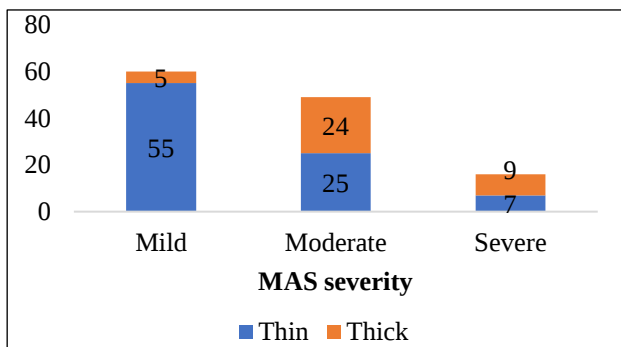
**Figure 7: Mode of respiratory support among thin and thick meconium stained liquor study group.**



**Figure 8: Perinatal depression and HIE stage I among thin and thick meconium stained liquor study group.**



**Figure 10: Outcome among thin and thick meconium stained liquor study group.**



**Figure 9: Mas severity diagnosis among thin and thick meconium-stained liquor study group.**

In the present study, 73.68% in thick and 22.98% in thin MSL study group had perinatal depression. No babies had stage II or stage III HIE (Figure 8).

In the present study, majority of the babies had mild MAS. Moderate to severe disease was seen in thick as compared to thin MSL group (Figure 9).

In this study, majority (44.73%) in thick MSL had morbidity in terms of perinatal depression, sepsis, pneumothorax and PPHN. Overall mortality was found to be 1.6% (2). PPHN and sepsis were the complications that lead to mortality among the study group (Figure 10).

## DISCUSSION

This was a prospective observational study undertaken to find outcome in neonates with meconium stained liquor in terms of morbidity and mortality and to compare the outcome of neonates with thin and thick meconium stained liquor.

Total 125 babies were born through meconium stained liquor in ESICMC PGIMS Medical College during the study period out of which 87 babies born through thin meconium stained liquor and 38 babies born through thick stained liquor.

Majority (69.6% n=87) had thin meconium-stained liquor. Similar results were observed in studies conducted by Raju et al and Koppad et al.<sup>13,11</sup> However study conducted by Shilpashri et al showed higher incidence of thick MSL.<sup>10</sup>

In the present study, majority (72%) were >2.5 kg and similar observations were seen in studies conducted by Valekar et al, Shilpashri et al and Koppad et al.<sup>14,10,11</sup>

Meconium staining of amniotic fluid increases with gestational age, as motilin is secreted in higher quantities as gestation age advances. In this study, majority (89.6%) were term babies and similar results were observed in study conducted by Singh et al, Shilpashri et al, Koppad et al.<sup>12,10,11</sup>

Majority (69.8%) in thick MSL group had APGAR score at 1minute <7, in contrast to studies conducted by Dhannaram et al and Singh et al.<sup>15,16</sup>

This gives credence to the theory that meconium aspiration is predominantly an intrauterine event which occurs in response to continued fetal gasping in a hypoxic environment and tracheal suctioning at birth cannot completely eliminate development of MAS.

In the present study, APGAR score at 5 minutes in majority of the babies was >7 in both thick and thin MSL groups (92% and 93% respectively). Similar results were observed in thin MSL group conducted by Patil et al and Singh et al.<sup>17,16</sup>

However in contrast to the present study, studies done by Patil et al and Singh et al showed that 21% and 40% respectively in thick msl group had 5 min Apgar score <7.<sup>17,16</sup>

Majority of the babies in thin MSL group had Downes score less than 4 and majority in thick MSL group had Downes score >4, implying that babies born through thick MSL are more likely to develop respiratory distress. Similar results were observed in study conducted by Patil et al.<sup>17</sup>

Majority (91.9%) in thin MSL group required non-invasive ventilation, similar to studies conducted by Dhannaram et al and Rao et al.<sup>15,17</sup>

A 23.6% required invasive ventilation among the thick MSL study group, in contrast to studies conducted by Dhannaram et al and Rao et al (5.8% and 9.4% respectively).<sup>15,17</sup>

Perinatal depression was the most commonly associated complication with MAS. This was comparable to studies conducted by Shilpasri et al, Koppad et al, Singh et al.<sup>10-12</sup>

Inflammatory substances-mediated pulmonary vasoconstriction and chronic hypoxia-mediated abnormal muscularization and architectural changes of pulmonary vessels results in pulmonary hypertension. Meconium also acts as irritant and a good culture media for bacteria thus promoting lung infection. Sepsis and PPHN were the complications that lead to mortality in study group. In the present study, neonatal mortality was 1.6% and morbidity was 55.2%, comparable to study done by Koppad et al.<sup>11</sup> Mortality was higher in studies conducted by Singh et al and Shilpasri et al.<sup>12,10</sup>

This study has limitation that long term follow up for morbidities due to MAS was not done.

## CONCLUSION

Thick meconium stained amniotic fluid is associated with increased risk perinatal depression, persistent pulmonary hypertension, sepsis, severe meconium aspiration syndrome and mortality.

## ACKNOWLEDGEMENTS

Authors would like to thank all pediatric staff for immense support, giving valuable suggestions with expertise and constant support towards the completion of the study.

*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:** Parveen A, Udayakumar S, Pushpalatha K, Karthik RN. Clinical outcome of babies born through meconium stained liquor. *Int J Contemp Pediatr* 2023;10:1699-704.