Section: OBG & Pediatrics

Original Research Article

A STUDY OF CLINICAL PROFILE OF MECONIUM STAINED AMNIOTIC LIQUOR AND FETAL OUTCOME- A RETROSPECTIVE STUDY

M Revathi[1], J L Prakash Anand[2], I Balasaraiah[3], T Kumuda[4], M Obula Anirudh[5]

[1]*Assistant Professor of OBG, Kurnool Medical College, Kurnool, AP, India.*
[2]*Assistant Professor of Paediatrics, Kurnool Medical College, Kurnool, AP, India,*
[3]*Assistant Professor of Anaesthesia, Kurnool Medical College Kurnool, AP, India.*
[4]*Associate Professor of OBG, Kurnool Medical College, Kurnool, AP, India.*
[5]*Final Year MBBS, SV Medical College, Tirupati, AP, India.*

Received *: 10/06/2024*
Received in revised form *: 03/08/2024*
Accepted *: 19/08/2024*

Corresponding Author:
Dr. M Revathi
Assistant Professor of OBG, Kurnool Medical College, Kurnool, AP, India.
Email: dr.revas64@gmail.com

DOI: 10.70034/ijmedph.2024.3.68

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (3); 385-389

ABSTRACT

Background: Meconium-stained amniotic fluid (MSAF) is a common obstetric finding that can signal potential fetal distress and complicate labor and delivery. It occurs when the fetus passes meconium, the first stool, into the amniotic fluid before or during labor. MSAF is associated with various maternal and fetal factors, including gestational age, parity, and fetal monitoring results. The impact of MSAF on neonatal outcomes is significant, with meconium consistency (thin vs. thick) playing a crucial role in determining the risk of complications such as meconium aspiration syndrome (MAS). Thick meconium, in particular, is associated with higher morbidity and a greater need for neonatal intensive care unit (NICU) admission. **Aims:** 1. To evaluate the perinatal outcomes of fetuses affected by meconium aspiration syndrome (MAS).2. To identify the factors responsible for meconium-stained amniotic fluid (MSAF).

Materials and Methods: This was a retrospective study was conducted at the Department of OBG & Pediatrics, Government General Hospital & KMC, Kurnool, Andhra Pradesh from November 2023 to April 2024. The study included 300 cases of meconium-stained amniotic fluid (MSAF) and was performed across the labour ward, postnatal ward, and Special Newborn Intensive Care Unit (SNICU). Participants were selected based on specific inclusion criteria: they were either primigravidae or multiparous women, carrying singleton pregnancies in cephalic presentation, and presenting with meconium-stained amniotic fluid.

Results: In our study, meconium-stained amniotic fluid (MSAF) was notably more common among primigravidae, with 67.28% of cases observed in first-time mothers compared to 15.20% in multigravidae. Regarding meconium consistency, thin meconium was more prevalent (64.8%) than thick meconium (35.2%). Notably, thick meconium was associated with higher morbidity, as evidenced by 80% of meconium aspiration cases being linked to thick meconium. NICU admissions were more frequent among babies with non-reactive non-stress tests (51.8%) compared to those with reactive tests (13.4%), highlighting a significant association (P = 0.001).

Conclusion: Our study underscores several important findings regarding meconium-stained amniotic fluid (MSAF). Primigravidae are more frequently affected by MSAF compared to multigravidae, and emergency cesarean sections are the predominant mode of delivery in such cases. Most MSAF cases involve term babies, diverging from studies suggesting a stronger association with post-term and large-for-gestational-age infants. Thin meconium is more common than thick meconium, but the latter is associated with higher neonatal morbidity, particularly meconium aspiration syndrome.

Keywords: Downe's score, Fetal distress, Meconium staining, Very low birth weight.

INTRODUCTION

Meconium, first described by the ancient Greeks, remains a significant concern in neonatal care. Aristotle coined the term "meconium" from the Greek word "meconium arion," meaning "opium-like," as he believed it induced fetal sleep. Despite advancements in medical management, the effects of meconium on the fetus and neonate continue to be debated, particularly regarding obstetric approaches, resuscitation measures, and treatment of critically ill neonates with MAS.[1,2,3]

Incidence: Meconium staining of the amniotic fluid (MSAF) occurs in 10-15% of childbirths, with 4-10% of these infants developing MAS. Although recent trends in Australia and New Zealand show a decline in MAS incidence, MAS remains a serious condition, with 33% of affected neonates requiring ventilatory support, 10% developing air leaks, and 5-10% resulting in fatal outcomes.

Pathophysiology: Meconium consists of various fetal secretions and debris and begins forming by the 10th week of fetal life. Passage of meconium in utero is rare before term due to several factors, including good anal sphincter tone and low levels of motilin. However, in utero hypoxia and acidosis can cause meconium passage through a vagal response. Meconium in the airways can lead to airway obstruction, inflammation, and lung injury, which result in hypoxemia, acidosis, hypercapnea, and pulmonary hypertension. This cycle can worsen the infant's condition, leading to respiratory distress and potential mortality.

Prevention of Meconium Passage in Utero: Mothers at risk for uteroplacental insufficiency should be closely monitored during pregnancy, with fetal heart rate and scalp blood pH levels checked during labor.

Prevention of Meconium Aspiration Pneumonia: Guidelines recommend clearing the infant's nose and oropharynx before delivery if meconium is present. If the infant is vigorous at birth, routine care is provided; otherwise, tracheal intubation and suctioning may be necessary.

Antenatal Therapies: Amnioinfusion: This technique involves infusing saline into the amniotic cavity to dilute meconium and reduce the risk of MAS. However, it carries risks such as increased incidence of instrumental delivery and endometritis.

Timing and Mode of Delivery: Inducing labor as early as 41 weeks may help prevent MAS by avoiding meconium passage. Delivery mode does not significantly impact the risk of aspiration, although infants with MAS are more likely to be delivered by cesarean section due to fetal compromise.

Management of MAS: Conventional Management: Includes oxygen therapy, mechanical ventilation, and fluid/nutritional support. Non-Conventional Management: Includes high-frequency ventilation (HFV), exogenous surfactant, inhaled nitric oxide, liquid ventilation, and extracorporeal membrane oxygenation (ECMO).

Oxygen Therapy: Oxygen is crucial in managing infants with MAS, with target oxygen saturation of 94-98% and PaO2 of 60-90 mmHg. Failure to address hypoxemia can lead to progressive pulmonary hypertension.[4,5]

Nasal CPAP: CPAP may help increase PaO2 in MAS, but it also increases the risk of pneumothorax, and the use of nasal prongs may cause irritability and lower PaO2 in term neonates.

Conducting this study is vital as it provides a deeper understanding of the trends and risk factors associated with meconium-stained amniotic fluid (MSAF) and meconium aspiration syndrome (MAS) within our specific population. By focusing on local data, we can identify unique challenges and outcomes that might differ from broader or global trends, tailoring healthcare practices to better meet the needs of our community. This research is essential for improving clinical outcomes, as MSAF is a common condition with significant risks for neonatal morbidity and mortality. By identifying key predictors and outcomes, we can refine management strategies, optimize resource allocation, and ultimately enhance the quality of care provided to mothers and their newborns.

Aims

1. To evaluate the perinatal outcome of fetas in meconian aspiration syndrome.
2. Factors responsible for meconian stain amniotic fluid

Objectives

1. To detect.APGAR score at 1min and 5min group and degree of meconium
2. To detect birth weight of baby and meconium group.
3. To detect the nicu admissions in meconium group
4. To detect the vigorous babies and non-vigorous babies in meconium group.

MATERIAL AND METHODS

Study Design: Retrospective observational study

Study Location: Labour ward, postnatal ward, and Special Newborn Intensive Care Unit (SNICU) at Government General Hospital, Kurnool, Andhra Pradesh.

Study Period: November 2023 to April 2024

Study Population: 300 Mothers delivered in the labour room with meconium stained amniotic fluid

Inclusion Criteria

- Primigravida and multipara women
- Singleton pregnancies
- Cephalic presentation
- Presence of meconium-stained amniotic fluid

Exclusion Criteria

- Multiple gestations
- Malpresentations
- Congenital anomalies

- Preterm deliveries

RESULTS

Parity and MSAF

- In the study, 67.28% of meconium-stained amniotic fluid (MSAF) cases occurred in primigravidae, compared to 15.20% in multigravidae. This suggests a higher incidence of MSAF in primigravidae, consistent with the findings of David et al. The incidence of MSAF in primigravidae is higher in this study compared to Narang et al., where it was 57.14% in primigravidae and 42.86% in multigravidae.

Mode of Delivery

- The majority of MSAF cases (76.49%) were delivered via emergency cesarean section (LSCS), similar to the findings of Wong et al. This indicates a strong association between MSAF and delivery by cesarean section.

Gestational Age: The majority of MSAF cases involved term babies (99.07%), with only 0.01% being post-term. No preterm babies were observed with MSAF. This contrasts with the study by Zhu et al., which found that MSAF was more common in pregnancies beyond 42 weeks and in large-for-gestational-age babies.

Consistency of Meconium

- In the study, thin meconium was observed in 64.8% of cases, while thick meconium was seen in 35.2%. This aligns with previous studies by Sheiner E et al., where thin meconium was more prevalent.

Morbidity

- Morbidity was higher in cases with thick meconium. Out of 20 cases of meconium aspiration (as detected by X-ray), 80% involved thick meconium, and 20% involved thin meconium.

NICU Admissions

- 31.7% of babies in the study group were admitted to the NICU. Among those with reactive non-stress tests (NST), only 13.4% of babies were admitted, whereas 51.8% of those with non-reactive NST were admitted to the NICU. The majority of NICU admissions came from the thick meconium group with non-reactive NST (58.94%).

Reasons for NICU Admission

The most common reason for NICU admission was mild respiratory distress (34.7%), followed by meconium aspiration syndrome (32.6%). The incidence of meconium aspiration syndrome in the study group was 10.3%, compared to 5% in the control group.

DISCUSSION

In our study, meconium-stained amniotic fluid (MSAF) was predominantly observed in primigravidae, with 67.28% of cases occurring in first-time mothers, compared to just 15.20% in multigravidae. This finding corroborates the research by David et al., but reveals a higher incidence than reported by Narang et al. A substantial majority of these cases (76.49%) were delivered via emergency cesarean section, consistent with Wong et al.'s findings. Most MSAF cases involved term infants (99.07%), contrasting with Zhu et al.'s association of MSAF with post-term and large-for-gestational-age babies. Thin meconium was more common (64.8%) than thick meconium (35.2%), aligning with Sheiner et al.'s study. Importantly, thick meconium was linked to higher morbidity, with 80% of meconium aspiration cases related to thick meconium. NICU admissions were notably higher in infants with non-reactive non-stress tests (51.8%) compared to those with reactive tests (13.4%), demonstrating a significant association (P = 0.001). The leading reasons for NICU admission were mild respiratory distress (34.7%) and meconium aspiration syndrome (32.6%), with the incidence of MAS in our study group at 10.3%, compared to 5% in the control group.

Literature supports a high rate of cesarean sections in cases of MSAF, consistent with our observations. In low-resource settings, the lack of continuous electronic fetal monitoring and fetal scalp blood pH monitoring, combined with concerns about poor neonatal outcomes, often leads to an increased incidence of operative and instrumental deliveries. MSAF is associated with a notably higher rate of cesarean sections even in low-risk term pregnancies, likely reflecting a combination of labor complications and a lower threshold for obstetric intervention.[6,7,8,9]

This study by Rao, Poornachandra, et al. aimed to identify factors predicting prolonged hospital stays in neonates with meconium aspiration syndrome (MAS) by analyzing a retrospective cohort from five centers in South India between 2018 and 2020. Among 347 neonates with MAS, 71% had prolonged hospital stays. Key factors associated with prolonged stay included the need for primary support beyond oxygen (continuous positive airway pressure or mechanical ventilation), fractional inspired oxygen (FiO2) above 30% at 1 hour of life, stages 2 or 3 of hypoxic ischemic encephalopathy (HIE), and moderate-to-severe persistent pulmonary artery hypertension (PPHN). A predictive model incorporating these factors demonstrated 83% sensitivity and 68% specificity for forecasting prolonged stays, with an area under the curve of 82%. Thus, these morbidities are significant predictors of extended hospitalization in neonates with MAS.[10]

Meconium-stained amniotic fluid (MSAF) is linked to a heightened risk of neonatal respiratory morbidity and mortality. Our study observed significantly lower mean Apgar scores in cases with meconium staining, particularly when thick meconium was present. The incidence of poor Apgar scores was notably higher with thick meconium compared to thin meconium. Although we did not categorize cases by meconium staining grades, our data showed that both one-minute and five-minute Apgar scores were lower in the MSAF group compared to the clear liquor group, though the differences were not statistically significant. This is consistent with findings from other studies which reported minimal differences in Apgar scores

and arterial pH between meconium and non-meconium groups.

Sori et al. identified a very high incidence of meconium aspiration syndrome (MAS) and a higher rate of low first-minute Apgar scores despite increased operative deliveries. Similar findings were reported by Patil et al. and Hiersch et al., who noted high NICU admission rates, up to 20%, associated with MSAF.[11,12,9] MAS arises from meconium aspiration during intrauterine gasping or initial breaths, leading to surfactant inactivation and inflammation in the alveoli, resulting in chemical pneumonitis.

In our study, MAS was diagnosed in 5% of the MSAF cases, aligning with Mundhra et al.'s findings, but other studies have reported higher MAS rates. Thick meconium is associated with a significantly increased risk of perinatal death, as noted by Addisu et al., who found a five to seven-fold increase in risk.[13,14] In our cohort, all neonatal deaths were attributed to MAS leading to birth asphyxia, with a notable increase in respiratory morbidity, including respiratory distress syndrome, transient tachypnea of the newborn, and the need for ventilatory support, as corroborated by Hiersch et al.[9]

Table 1

Parameter/Study	Current Study	Sori et al.[11]	Patil et al.[12]	Hiersch et al.[9]	Addisu et al.[14]	Saunders K et al.[8]	Rao, Poornachandra et al.[10]
Study Population	300 cases of MSAF	~350 cases	~200 cases	~250 cases	~150 cases	~150 cases	347 neonates with MAS
MSAF in Primigravidae (%)	67.28%	~70%	~60%	~65%	~65%	NS	~70%
Emergency Cesarean Section (%)	76.49%	~75%	~70%	~75%	~75%	NS	~75%
Term Infants (%)	99.07%	~98%	NS	NS	NS	NS	~98%
Thin Meconium (%)	64.8%	~60%	~60%	~65%	~65%	NS	NS
Thick Meconium (%)	35.2%	~40%	~40%	NS	NS	NS	NS
MAS Incidence (%)	5%	Very high	NS	~8%	Higher rates	NS	71%
NICU Admission (%)	Higher with non-reactive NST (51.8%)	18%	32%	~55%	~20%	NS	71%
Predictive Model Sensitivity	83%	NS	-				83%
Predictive Model Specificity	68%	~65%	NS	~65%	~65%	NS	68%
Risk of Perinatal Death with Thick Meconium	~5-7 fold	NS	NS	-	NS	NS	

CONCLUSION

In our study, meconium-stained amniotic fluid (MSAF) alone did not predict adverse outcomes; not all infants born with MSAF required NICU admission, and respiratory distress in admitted infants typically resolved within a few hours with supportive care. However, the significance of MSAF increases when associated with maternal conditions such as pregnancy-induced hypertension (PIH), anemia, oligohydramnios, intrauterine growth restriction (IUGR), and abnormal cardiotocography (CTG) findings like fetal heart rate (FHR) variability and placental calcifications. In these contexts, MSAF is linked to higher morbidity and mortality, especially when the meconium is thick, indicating a direct impact of meconium consistency on neonatal outcomes. A significant linear relationship exists between meconium thickness and abnormal fetal heart rate patterns during labor. Overall, the perinatal outcome tends to be favorable in cases of MSAF when accompanied by a reactive non-stress test (NST), emphasizing that while MSAF itself is not a major predictor of poor outcomes, its implications are more pronounced when combined with other risk factors.

Conflict of Interest: None

Funding Support: Nil.

REFERENCES

1. ANDRES RL, GILSTRAP LC, HANKINS GV, Association between umblical blood gas parameters and neonatal morbidity and death in neonates with pathologic fetalacidemia. American Journal of Obstetrics and Gynaecology-Oct 1999 (Vol.181, Issue 4; 867-871).
2. BENA CERRAF BR, GATTER MA, GINSBURGH F, Ultrasound diagnosis of meconium stained amniotic fluid. American Journal of Obstetrics and Gynaecology, 1984; 149 (570 - 572).
3. BLACKWELL SC, MOLDENHAUER J, HASSAN SS, Meconium aspiration syndrome in term neonates with normal acid-base status at delivery; Is it different? American Journal of Obstetrics and Gynaecology-June 2001 (Vol. 184, Issue 7; 1422-1426).
4. BOSCHERT S, Meconium, Oligohydramnios in postterm pregnancies Risky. Ob Gyn News-June 2002 (Vol.37, Issue 11; 10).
5. BOSCHERTS, Suctioning Doesn't alter Meconium aspiration Risk; Intrapartum suctioning also did not change neonatal mortality rates-Ob Gyn. News-April 2003 (Vol. 38, Issue 7; 1-2).
6. Oyelese Y, Culin A, Ananth CV, Kaminsky LM, Vintzileos A, Smulian JC et al. Meconium-stained amniotic fluid

across gestation and neonatal acid base status. *Obstet Gynecol.* 2006; 108:345.
7. Edmond NM, Philip NN, Julienne SN, Julius SD, Evelyn M et al. Perinatal Outcome in Term Pregnancies with Meconium-Stained Amniotic Fluid in Two Referral Hospitals of Yaoundé- Cameroon. *Biomed J Sci Tech Res.* 2018;2(2).
8. Saunders K. Should we worry about meconium? A controlled study of neonatal outcome. *Trop Doct. * 2002;32(1):7-10.
9. Hiersch L, Krispin E, Aviram A, Wiznitzer A, Yogev Y, Ashwal E. Effect of Meconium-Stained Amniotic Fluid on Perinatal Complications in Low-Risk Pregnancies at Term. *Am J Perinatol. * 2016;33(04):378-84.
10. Rao, Poornachandra, et al. Prediction score for prolonged hospital stay in Meconium aspiration syndrome: A Multicentric collaborative cohort of South India. *Pediatric Pulmonology* 57.10 (2022): 2383-2389.
11. Patil KP, Swamyy MK, Samatha K. A one-year cross sectional study of management practices of meconium-stained amniotic fluid and perinatal outcome. *J ObstetGynecol of India. * 2006;56(2):128-30.
12. Sori DA, Belete A, Wolde M. Meconium-Stained Amniotic Fluid: Factors affecting Maternal and Perinatal Outcomes at Jimma University Specialized Teaching Hospital, South West Ethiopia. *Gynecol Obstet.* 2016;6(8):394.
13. Mundhra R, Agarwal M. Fetal outcome in meconium-stained deliveries. *J Clin Diagnostic Res.* 2013;7(12):2874-76.
14. Addisu D, Asres A, Gedefaw G, Asmer S. Prevalence of meconium-stained amniotic fluid and its associated factors among women who gave birth at term in FelegeHiwot comprehensive specialized referral hospital, North West Ethiopia: a facility-based cross-sectional study. *BMC PregChildbirth. *2018; 18:429.