



RESEARCH ARTICLE

Risk Factors for Meconium Stained Liquor and Outcome of Neonate in Meconium Stained Amniotic Fluid

Richa Sulaniya, Anju Depan, Meenakshi Samaria, Kanti Yadav*

ABSTRACT

Background: Meconium-stained amniotic fluid (MSAF) is a common obstetric finding associated with increased perinatal morbidity and mortality. It may indicate fetal distress, placental insufficiency, or physiological gastrointestinal maturation in term pregnancies. Early recognition of maternal and intrapartum risk factors is important for timely intervention and improved neonatal outcomes.

Objective: To identify risk factors associated with meconium-stained liquor and evaluate neonatal outcomes among deliveries complicated by MSAF.

Methods: A prospective observational study was conducted over two years (January 2024 to January 2026) in 100 women with meconium-stained liquor during labor. Maternal demographic data, obstetric risk factors, intrapartum variables, mode of delivery, and neonatal outcomes were recorded. Statistical analysis was performed using SPSS version 24. Chi-square test was used, and $p < 0.05$ was considered significant.

Results: Postdated pregnancy (32%), pregnancy-induced hypertension (18%), oligohydramnios (16%), and prolonged labor (14%) were the commonest risk factors. Thick meconium was present in 42% cases and was significantly associated with low Apgar score at 5 minutes ($p=0.01$), meconium aspiration syndrome ($p=0.003$), NICU admission ($p=0.002$), and cesarean delivery ($p=0.02$). Overall NICU admission rate was 24%, while meconium aspiration syndrome occurred in 12% neonates.

Conclusion: Meconium-stained liquor is strongly associated with postdated pregnancy and hypertensive disorders. Thick meconium significantly increases adverse neonatal outcomes. Prompt intrapartum monitoring and early neonatal resuscitation are essential to reduce morbidity.

Keywords: Intrapartum monitoring, Neonatal resuscitation, Morbidity, Thick meconium.

Indian J. Pharm. Biol. Res. (2026): <https://doi.org/10.30750/ijpbr.14.2.13>

INTRODUCTION

About 10–20% of all deliveries, especially in term and post-term pregnancies, result in meconium-stained amniotic fluid (MSAF), a common obstetric complication. Meconium is a thick, greenish-black, sterile substance made up of water, lanugo, mucus, bile pigments, and fetal intestinal epithelial cells. Meconium passage in utero might be pathogenic as a result of hypoxia and vagal activation, or physiological as a result of fetal gastrointestinal maturation(1). Because meconium is linked to more problems for mothers and newborns and may indicate underlying fetal impairment, its presence in amniotic fluid is clinically significant. MSAF is more common in pregnancies accompanied by placental insufficiency, oligohydramnios, intrauterine growth restriction, pregnancy-induced hypertension, diabetes, and delayed labor. Its frequency increases with increasing gestational age(2).

The anal sphincter may relax in response to intrapartum fetal distress, allowing meconium to enter the liquor. Depending on its consistency, meconium can

Department of Obstetrics and Gynaecology, Janana Hospital, JLN Medical College, Ajmer Rajasthan India.

Corresponding Author: Kanti Yadav, Department of Obstetrics & Gynaecology, Janana hospital, JLN Medical College, Ajmer Rajasthan India, Email: kantiyadav31@gmail.com

How to cite this article: Sulaniya R, Depan A, Samaria M, Yadav K. Risk Factors for Meconium Stained Liquor and Outcome of Neonate in Meconium Stained Amniotic Fluid. Indian J. Pharm. Biol. Res. 2026;14(2):63-66.

Source of support: Nil

Conflict of interest: None.

Received: 20/03/2026 **Revised:** 25/03/2026 **Accepted:** 10/04/2026

Published: 28/04/2026

be categorized as thin or thick; thick meconium has a stronger correlation with fetal hypoxia and aspiration risk, making it more clinically significant. Adverse outcomes such poor Apgar score, respiratory distress, meconium aspiration syndrome, neonatal sepsis, NICU admission, and,

in extreme situations, perinatal mortality are more likely to occur in newborns born through meconium-stained liquor. Aspirating meconium-contaminated fluid prior to, during, or right after birth causes meconium aspiration syndrome, which can cause pulmonary hypertension, chemical pneumonitis, airway obstruction, and surfactant inactivation(3).

MSAF is still a problem in obstetric practice, particularly in countries with low resources, despite improvements in intrapartum fetal monitoring and newborn care. Early prediction, suitable monitoring, and prompt intervention can all be aided by the identification of maternal and labor-related risk factors. Over the course of two years, from January 2024 to January 2026, the current study was conducted to examine the common risk factors associated with meconium-stained liquor and to assess neonatal outcomes in pregnancies complicated by meconium-stained amniotic fluid. The results could lead to better newborn outcomes and perinatal care techniques(4).

METHODS

Study Design: Prospective observational study.

Study Period: January 2024 to January 2026.

Sample Size: 100 women with meconium-stained liquor during labor.

Setting: Tertiary care obstetrics unit.

Inclusion Criteria

- Singleton pregnancy
- Cephalic presentation
- Gestational age ≥ 37 weeks
- Meconium-stained amniotic fluid during labor

Exclusion Criteria

- Congenital fetal anomalies
- Multiple pregnancy
- Preterm labor
- Intrauterine fetal demise

Data Collected

Maternal age, parity, gestational age, risk factors, type of meconium (thin/thick), CTG changes, mode of delivery, Apgar score, NICU admission, meconium aspiration syndrome.

Statistical Analysis

Data analyzed using SPSS version 24. Chi-square/Fisher exact test applied. $p < 0.05$ significant.

RESULTS

Table 1: Maternal Risk Factors for MSAF (n=100)

Risk factor	Frequency	Percentage
Postdated pregnancy	32	32%
PIH	18	18%
Oligohydramnios	16	16%
Prolonged labor	14	14%
Gestational diabetes	10	10%
No identifiable factor	10	10%

Table 2: Type of Meconium and Mode of Delivery

Type of meconium	Vaginal	Instrumental	Cesarean	Total	p-value
Thin (58)	34	6	18	58	
Thick (42)	12	8	22	42	0.02

Table 3: Neonatal Outcome by Type of Meconium

Outcome	Thin (58)	Thick (42)	p-value
Low Apgar <7 at 5 min	6	14	0.01
NICU Admission	8	16	0.002
MAS	2	10	0.003
Neonatal Sepsis	1	4	0.09

Table 4: Gestational Age and MSAF Severity

Gestational Age	Thin	Thick	Total	p-value
37–40 weeks	42	18	60	
>40 weeks	16	24	40	0.01

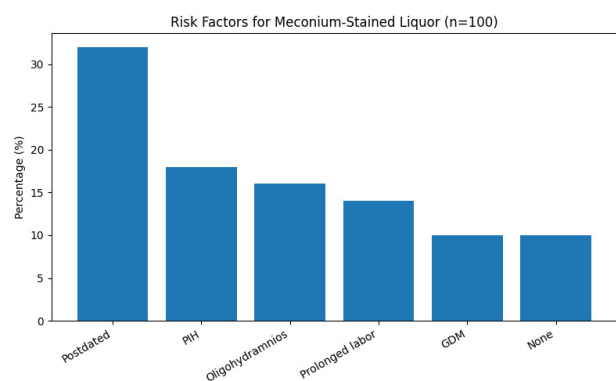


Figure 1: Risk factors for Meconium stained liquor

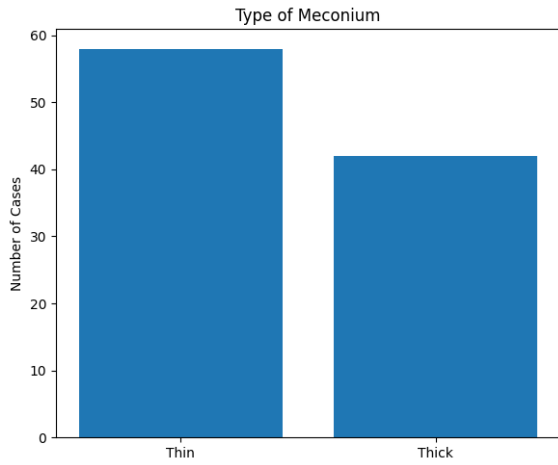


Figure 2: Types of Meconium

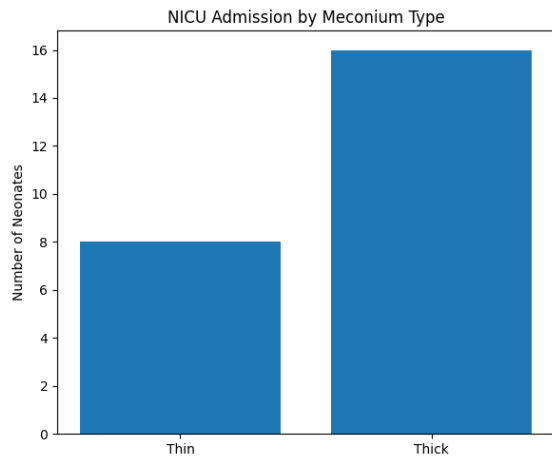


Figure 3: NICU admission by Meconium type

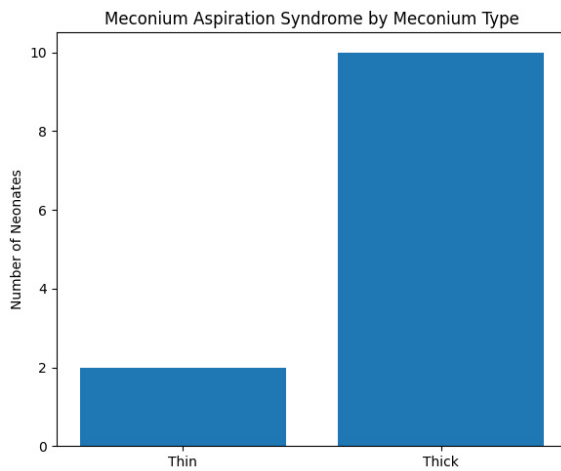


Figure 4: Meconium aspiration syndrome by Meconium type

DISCUSSION

The present prospective study was conducted to evaluate the risk factors associated with meconium-stained liquor and to assess neonatal outcomes among 100 deliveries complicated by meconium-stained amniotic fluid over a two-year period. Meconium-stained liquor remains an important obstetric concern because it is frequently associated with fetal distress, increased operative delivery, and neonatal morbidity. The findings of this study demonstrated that postdated pregnancy, pregnancy-induced hypertension, oligohydramnios, and prolonged labor were the most common associated risk factors. In addition, thick meconium was significantly associated with adverse neonatal outcomes including low Apgar score, NICU admission, and meconium aspiration syndrome(5).

Postdated pregnancy was the leading risk factor, identified in 32% of cases. This is consistent with previous evidence showing that the incidence of meconium passage increases with advancing gestational age, particularly beyond 40 weeks. As pregnancy continues beyond term, placental insufficiency and reduced amniotic fluid volume may lead to chronic fetal stress and relative hypoxia, thereby increasing vagal stimulation and fetal bowel peristalsis. Physiological maturation of the fetal gastrointestinal tract may also contribute to meconium passage in post-term fetuses(6).

Pregnancy-induced hypertension was present in 18% of cases and represented another important contributor. Hypertensive disorders impair uteroplacental perfusion, resulting in reduced oxygen delivery to the fetus and chronic fetal stress, which may precipitate passage of meconium. Oligohydramnios, observed in 16% of cases, may intensify umbilical cord compression during labor and increase the concentration of meconium in the liquor, making staining more pronounced. These findings emphasize the need for close antenatal surveillance in high-risk pregnancies(7).

In the present study, thick meconium was observed in 42% of cases and was significantly associated with cesarean delivery ($p=0.02$). Thick meconium often raises concern regarding fetal compromise, abnormal cardiotocography, and aspiration risk, resulting in a lower threshold for operative intervention. However, mode of delivery should always be individualized based on fetal condition and labor progress(8).

Neonatal outcomes were notably worse in the thick meconium group. Low Apgar score at 5 minutes occurred significantly more frequently ($p=0.01$), suggesting intrapartum compromise or delayed neonatal adaptation. NICU admission was required in 24% of neonates overall

and was significantly higher in the thick meconium group ($p=0.002$), reflecting the need for respiratory support and close observation. Meconium aspiration syndrome developed in 12% of neonates and was strongly associated with thick meconium ($p=0.003$). MAS remains one of the most serious complications of MSAF and may cause airway obstruction, chemical pneumonitis, surfactant inactivation, and pulmonary hypertension(9).

Although neonatal sepsis was more common in thick meconium cases, the association was not statistically significant ($p=0.09$), possibly due to the limited sample size. The strengths of this study include prospective data collection and focused evaluation of maternal and neonatal outcomes. However, limitations include single-center design, modest sample size, lack of a non-MSAF comparison group, and absence of long-term neonatal follow-up(10).

Overall, the findings indicate that meconium-stained liquor, particularly thick meconium, is an important marker of adverse perinatal outcome. Enhanced monitoring of postdated and high-risk pregnancies, timely labor management, and coordinated obstetric-neonatal care can significantly improve neonatal prognosis(11).

CONCLUSION

Meconium-stained amniotic fluid remains a significant obstetric concern because of its association with fetal compromise and adverse neonatal outcomes. In the present study of 100 cases over two years, postdated pregnancy, pregnancy-induced hypertension, oligohydramnios, and prolonged labor were the most common risk factors associated with meconium-stained liquor. These findings highlight the importance of vigilant antenatal surveillance and intrapartum monitoring in high-risk pregnancies.

Thick meconium was strongly associated with unfavorable neonatal outcomes, including low Apgar scores, increased NICU admissions, higher operative delivery rates, and a significantly greater incidence of meconium aspiration syndrome. This emphasizes that not all meconium staining carries equal risk, and the consistency of meconium should be considered during labor management and delivery planning.

Timely recognition of fetal distress, continuous fetal heart rate monitoring, appropriate decision-making regarding mode of delivery, and availability of trained neonatal resuscitation teams are essential to minimize

morbidity. Early neonatal assessment and prompt respiratory support further improve outcomes.

In conclusion, meconium-stained liquor, especially thick meconium, should be managed as a high-risk intrapartum condition. Strengthening obstetric and neonatal care pathways can reduce complications and improve perinatal outcomes. Larger multicenter studies are recommended to further refine risk stratification and evidence-based management strategies.

REFERENCES

1. Rashid R, Mollah AH, Banerjee M, Ahmed SS, Mahmud S. Risk Factors Associated with Meconium-Stained Amniotic Fluid in Neonates: A Tertiary Centre Experience from Bangladesh. *Acad J Pediatr Neonatol*. 2021;10(2):00109–13.
2. Sahitya C, Surya KK, Chandy BM. IMMEDIATE OUTCOME OF NEONATES MECONIUM STAINED AMNIOTIC FLUID. *Int J Acad Med Pharm*. 2025;7(3):800–3.
3. A SR, Yohannan V, Antony L, Natour M Al, Krishnaswami T, Shama MB. Troubled Waters : The Hidden Risks of Meconium-Stained Liquor. *J Neonatal Surg*. 2025;14(4):76–82.
4. Nirmala C, Thomas L, Sujatha Y. Risk factors of meconium stained amniotic fluid-a case control study. *Int J Clin Obstet Gynaecol*. 2020;4(2):157–60.
5. Indu Khare, Gunjan Gunjan, Ashutosh Kumar AS. Risk Factors Associated with Meconium-Stained Amniotic Fluid and Neonatal Outcomes. *Int J Med Biomed Stud*. 2024;8(4):68–74.
6. Rao KS, Pathapati S, Vansipriya C. Risk factors for meconium stained liquor and outcome of neonate in meconium stained amniotic fluid. *Indian J Obstet Gynecol Res*. 2017;4(1):1–5.
7. Kumari N, Sahu S, Prasad S. Risk Factor for Meconium Stained Liquor and Outcome of Neonate in Meconium Stained Amniotic Fluid. *Int J Pharm Clin Res*. 2024;16(1):1684–7.
8. Rakhi Kumari, Seema RJ. Risk Factors for Meconium Stained Liquor and Outcome of Neonate in Meconium Stained Amniotic Fluid. *Int J Pharm Clin Res*. 2024;16(5):2325–8.
9. Sundaram R, Murugesan A. Risk factors for meconium stained amniotic fluid and its implications. *Int J Reprod Contraception, Obstet Gynecol*. 2016;5(8):2503–6.
10. Bhinder OS, Singh G, Thapar K, Nain P. Maternal risk factors and meconium stained amniotic fluid. *Int J Contemp Pediatr*. 2022;9(2):173–7.
11. Rajput SS, Verma YS, Yadav D. Study of Risk Factors and Outcome in Neonates Born with Meconium Stained Liquor. *Sch J Appl Med Sci*. 2016;4(9E):3548–52.