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Original Research Article

Role of Intrapartum Amnioinfusion in Meconium Stained Liquor: A Prospective Study at a Secondary Care Hospital in a Resource-Limited Setting

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Abstract

Background: Meconium-stained amniotic fluid (MSAF) is a common obstetric complication associated with fetal distress, meconium aspiration syndrome (MAS), increased operative deliveries, and neonatal morbidity and mortality. In resource-limited settings, intrapartum amnioinfusion has been proposed as a simple and cost-effective intervention to improve fetomaternal outcomes.

Aim: To evaluate the role of intrapartum transcervical amnioinfusion in women with meconium-stained amniotic fluid and its effect on maternal and neonatal outcomes at a secondary care hospital.

Materials and Methods: This prospective comparative study was conducted at Mansa Civil Hospital, a secondary care hospital, over a period of one year from April 2025 to April 2026. A total of 100 term pregnant women with meconium-stained liquor were included and divided into two groups. Group A consisted of 50 women who underwent transcervical amnioinfusion, while Group B included 50 women managed expectantly without amnioinfusion. Maternal and neonatal outcomes such as mode of delivery, amnioinfusion-to-delivery interval, Apgar score, neonatal resuscitation, NICU admission, incidence of MAS, and maternal complications were compared between the groups.

Results: Normal vaginal delivery was higher in the amnioinfusion group (72%) compared to the control group (64%), while the cesarean section rate was lower in Group A (18%) than Group B (30%). Neonatal outcomes were comparatively better in the amnioinfusion group, with lower rates of neonatal resuscitation (28% vs 36%), NICU admissions (18% vs 26%), and MAS referrals (8% vs 12%). A higher proportion of neonates in Group A had favourable Apgar scores >7 at 1 minute (78% vs 70%). Maternal complications were minimal and manageable.

Conclusion: Intrapartum transcervical amnioinfusion is a safe, simple, and effective intervention in cases of meconium-stained liquor. It reduces operative delivery rates and improves neonatal outcomes, making it particularly beneficial in resource-limited secondary care settings.

Keywords: Meconium-stained liquor; Meconium-stained amniotic fluid; Amnioinfusion; Meconium aspiration syndrome; Neonatal outcome; Secondary care hospital; Fetal distress.

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Introduction

The word ‘‘meconium’’ is derived from the Greek word mekoni, which means ‘‘poppy juice” or “opium-like,” referring to the belief that fetal exposure to meconium would lead to neonatal sleepiness or depression, a concept generally attributed to Aristotle. Meconium is the fetal colonic content, which is mainly composed of water (72% to 80%),exfoliated skin cells, lanugo, vernix caseosa, and gastrointestinal secretions(bile pigments, bile acids, pancreatic enzymes, free fatty acids). The typical greenish yellow color of meconium is attributed to bile pigments. Bilirubin, a product of heme catabolism, is the main pigment in meconium. While the intestinal content of children and adults is rich in bacteria, meconium during fetal life is sterile[1]. first appears in the fetal ilium between 10 and 16 weeks gestation[2]. Typically, healthy term neonates pass meconium within 24 to 48 hours after birth; however, its passage into the amniotic fluid prior to or during labor is abnormal and clinically significant. Passage of meconium in utero with staining of the amniotic fluid occurs in 12% to 16% of all deliveries[3]. Meconium passage is rare before 34

weeks of gestational age. Meconium passage occurs in up to 20% of full-term gestations and can occur in more than 35% of pregnancies continuing beyond 42 weeks' gestation[4]. The passage of meconium in utero may signify normal gastrointestinal maturation, but more frequently, it indicates fetal stress or hypoxia. Hypoxia stimulates vagal activity, increasing intestinal peristalsis and relaxation of the anal sphincter, allowing meconium release into the amniotic cavity[5].

Risk factors for meconium-stained amniotic fluid (MSAF)[6]:

Post-term pregnancy
Prolonged labor
Chorioamnionitis
Fetal growth restriction
Preeclampsia
Oligohydramnios
Vaginal breech delivery
Maternal drugs (eg, cocaine, castor oil, bowel. purgatives)
Intrahepatic cholestasis of pregnancy

Meconium aspiration syndrome(MAS) is believed to result from aspiration of meconium during intrauterine gasping or at the time of first breath. In case of hypoxia, gasping of fetus results in meconium aspiration which neutralises the surfactant action and promotes inflammation of lung tissues, whereas persistent hypoxia after birth, aspirated meconium results in pulmonary hypertension. and in severe cases, hypoxic brain damage or neonatal death[7]. Despite advances in neonatal intensive care, MAS continues to account for significant perinatal morbidity and mortality worldwide. The aim of this study was to assess feto maternal outcome following intrapartum amnioinfusion in patients with meconium stained amniotic fluid and the rate of Caesarean deliveries following intrapartum amnioinfusion in patients with meconium stained amniotic fluid.

Aim of the Study: To evaluate the role of intrapartum transcervical amnioinfusion in women with meconium-stained amniotic fluid and its effect on maternal and neonatal outcomes at a secondary care hospital.

Objectives of the Study

1. To assess the effect of intrapartum amnioinfusion on the mode of delivery in cases of meconium-stained liquor.
2. To evaluate neonatal outcomes following amnioinfusion, including Apgar score, need for neonatal resuscitation, NICU admission, and incidence of meconium aspiration syndrome (MAS).
3. To compare the amnioinfusion-to-delivery interval between the study groups.
4. To study maternal complications associated with intrapartum amnioinfusion.
5. To assess the safety and effectiveness of amnioinfusion in a resource limited secondary care setting.

Materials and Methods

The present study was a prospective comparative study conducted over a period of one year, from April 2025 to April 2026, at Mansa Civil Hospital, a secondary care hospital. The study included pregnant women admitted to the labor ward with meconium-stained amniotic fluid during the course of labor. A total of 100 women with meconium-stained liquor were enrolled in the study and divided into two groups. Group A (Amnioinfusion group) comprised 50 women who consented to undergo transcervical amnioinfusion during labor, while Group B (Control group) comprised 50 women with meconium-stained amniotic fluid who received standard intrapartum management without amnioinfusion. All participants were evaluated according to the study protocol.

Inclusion criteria

1. Gestational age of >/=37 weeks
2. Ruptured membranes
3. Presence of meconium stained liquor
4. Single live intrauterine fetus with cephalic presentation
5. Non scarred uterus
6. No evidence of fetal distress
7. Written & informed consent obtained

Exclusion criteria

1. Scarred uterus
2. Chorioamnionitis
3. Antepartum hemorrhage
4. Congenital malformation of fetus
5. Indication for immediate delivery such as severe fetal bradycardia or cord prolapse
6. Malpresentation

Detailed history taking, general physical examination, obstetric examination, and routine investigations were conducted for all patients.

Due to the unavailability of ultrasonography facilities, cardiotocography was performed for 20–40 minutes to assess fetal heart rate patterns, including baseline variability, accelerations, and decelerations.

In Group A, transcervical amnioinfusion was carried out under strict aseptic precautions after explaining the procedure and obtaining written informed consent. A sterile IV set connected to 0.9% normal saline was introduced transcervically beyond the fetal head, and saline was infused at a rate of 20 ml/min. An initial bolus was administered, and infusion was continued until the returning liquor became clear or up to a maximum of 1000 ml. Continuous or intermittent fetal heart rate monitoring was performed throughout the procedure and labor. Uterine tone and contractions were assessed at 15- minute intervals to detect uterine hyper stimulation in which case amnioinfusion was discontinued.

Augmentation with oxytocin was done in cases of inadequate uterine contractions or delay in the progress of labor in the absence of fetal bradycardia. Emergency lower segment cesarean section (LSCS) was performed in cases of fetal bradycardia or non-progress of labor. Outlet vacuum was kept ready for prolonged second stage of labor, and a pediatric team was on standby at delivery. Neonates were assessed immediately after birth using Apgar scores at 1 minute and 5 minutes. Group B patients were managed expectantly without amnioinfusion as per standard protocol. Both groups were monitored throughout labor and delivery, with observations made regarding mode of delivery, incidence of fetal distress, and neonatal outcomes.

Results

Table 1: Age wise distribution of cases

Age	Group A	Group B
<20 years	8(16%)	10(20%)
20-25 years	22(44%)	20(40%)
25-30 years	13(26%)	15(30%)
>30 years	7(14%)	5(10%)
Total	50(100%)	50(100%)

The majority of women in both groups belonged to the 20–25 years age group, accounting for 44% in Group A and 40% in Group B, followed by the 25–30 years age group. Women aged less than 20 years and more than 30 years constituted a smaller proportion in both groups. Overall, the age distribution was comparable between the two groups.

Table 2: Gestational Age wise distribution of cases

Gestational Age	Group A	Group B
37-40 weeks	30(60%)	28(56%)
>40 weeks	20(40%)	22(44%)
Total	50(100%)	50(100%)

Most women in both groups were between 37–40 weeks of gestation (60% in Group A and 56% in Group B), while 40% in Group A and 44% in Group B were beyond 40 weeks. The gestational age distribution was comparable between the two groups.

Table 3: Parity wise distribution of cases

Parity	Group A	Group B
Primiparous	32(64%)	26(52%)
Multiparous	18(36%)	24(48%)
Total	50(100%)	50(100%)

Primiparous women constituted the majority in both groups, accounting for 64% in Group A and 52% in Group B, while multiparous women accounted for 36% and 48% respectively. Overall, the parity distribution was comparable between the two groups.

Table 4: Onset of Labour

Onset of labour	Group A	Group B
Spontaneous	19(38%)	21(42%)
Induced	31(62%)	29(58%)
Total	50(100%)	50(100%)

The majority of women in both groups underwent induced labor, accounting for 62% in Group A and 58% in Group B, while spontaneous onset of labor was observed in 38% and 42% respectively. The distribution of onset of labor was comparable between the two groups.

Table 5: cervical dilatation at the time of meconium detection

Cervical dilatation	Group A	Group B
<4 cm	15(30%)	20(40%)
4-7 cm	25(50%)	22(42%)
>7 cm	10(20%)	9(18%)
Total	50(100%)	50(100%)

Most women in both groups had cervical dilatation between 4–7 cm at the time of meconium detection, accounting for 50% in Group A and 42% in Group B. A smaller proportion of women had cervical dilatation greater than 7 cm. Overall, the cervical dilatation at meconium detection was comparable between the two groups.

Table 6: Mode of Delivery

Mode of delivery	Group A	Group B
Normal vaginal delivery	36(72%)	32(64%)
Vacuum assisted vaginal delivery	5(10%)	3(6%)
LSCS	9(18%)	15(30%)
Total	50(100%)	50(100%)

This Table demonstrates the mode of delivery among the study groups. In the amnioinfusion group (Group A), normal vaginal delivery was observed in 36 (72%) women compared to 32 (64%) women in the non-amnioinfusion group (Group B). Vacuum vaginal delivery was performed in 5 (10%) cases in Group A and 3 (6%) cases in Group B.

The rate of lower segment cesarean section (LSCS) was lower in the amnioinfusion group, accounting for 9 (18%) cases, compared to 15 (30%) cases in the non-amnioinfusion group.

These findings suggest that intrapartum amnioinfusion in cases of meconium stained liquor may reduce the need for cesarean delivery and improve the chances of successful vaginal delivery. Hence, amnioinfusion appears to be a simple, safe, and effective intervention, which reduces operative deliveries and is beneficial for both maternal and neonatal outcomes.

Table 7: Amnioinfusion to delivery interval

Amnioinfusion to delivery interval	Group A	Group B
1-2 hours	19(38%)	14(28%)
2-4 hours	22(44%)	23(46%)
>4 hours	9(18%)	13(26%)
Total	50(100%)	50(100%)

Table demonstrates the distribution of the amnioinfusion to delivery interval among the study groups. In the amnioinfusion group (Group A), 19 (38%) women delivered within 1–2 hours, 22 (44%) within 2–4 hours, and 9 (18%) after more than 4 hours. In the non-amnioinfusion group (Group B), 14 (28%) women delivered within 1–2 hours, 23 (46%) within 2–4 hours, and 13 (26%) after more than 4 hours. A higher proportion of women in the amnioinfusion group delivered within the earlier time intervals, while prolonged delivery intervals (>4 hours) were more common in the non-amnioinfusion group. These findings suggest that intrapartum amnioinfusion may help shorten the delivery interval and improve labor outcomes in cases of meconium-stained liquor.

Table 8: Fetal outcomes

Fetal outcomes	Group A	Group B
Fetal distress	10(20%)	8(16%)
Asymptomatic	36(72%)	32(64%)
Needed resuscitation	14(28%)	18(36%)
NICU admission	9(18%)	13(26%)
Needed referral for MAS	4(8%)	6(12%)
Neonatal death	1(0.5%)	1(0.5%)

Table demonstrates the fetal outcomes among the study groups. The majority of neonates were asymptomatic at birth, accounting for 36 (72%) cases in the amnioinfusion group (Group A) and 32 (64%) cases in the non-amnioinfusion Group. Fetal distress was observed in 10 (20%) cases in Group A and 8 (16%) cases in Group B. The need for neonatal resuscitation was lower in the amnioinfusion group [14(28%)] compared to the non-amnioinfusion group [18 (36%)]. Similarly, NICU admissions were less frequent in Group A [9 (18%)] than in Group B [13(26%)]. Referral for management of meconium aspiration syndrome (MAS)was also lower in the amnioinfusion group [4 (8%)] compared to Group B [6(12%)]. Neonatal death was comparable in both groups, with one case in each group. Overall, intrapartum amnioinfusion was associated with improved neonatal outcomes, including reduced need for resuscitation, lower NICU admission rates, and fewer referrals for MAS. These findings suggest that amnioinfusion is a useful, simple, and cost-effective intervention in cases of meconium stained liquor, particularly in resource-limited secondary care settings where advanced neonatal intensive care facilities may not be readily available.

Table 9: Apgar score at 1 minute

Apgar score	Group A	Group B
<7	11(22%)	15(30%)
>/=7	39(78%)	35(70%)
Total	50(100%)	50(100%)

In our study, the majority of neonates in both groups had favourable Apgar scores (>/=7) at birth. In the amnioinfusion group (Group A), 39 (78%) neonates had an Apgar score >/=7, while 11 (22%) had an Apgar score <7. In comparison, in the non-amnioinfusion group (Group B), 35 (70%) neonates had an Apgar score >/=7 and 15 (30%) had an Apgar score <7. Thus, a higher proportion of neonates in the amnioinfusion group had better Apgar scores at birth, suggesting improved immediate neonatal outcomes with intrapartum amnioinfusion.

Table 10: Maternal complications

Maternal complications	Group A	Group B
Uterine hyper stimulation	5(10%)	0(0%)
Chorioamnionitis	1(0.5%)	0(0%)
Uterine rupture or other major complications	0(0%)	0(0%)

Table demonstrates the maternal complications among the study groups. Uterine hyper stimulation was observed in 5 (10%) cases in the amnioinfusion group (Group A), while no cases were reported in the non-amnioinfusion group (Group B). Chorioamnionitis occurred in 1 case in Group A, whereas no cases were noted in Group B. No cases of uterine rupture were observed in either group.

Overall, maternal complications associated with amnioinfusion were minimal and manageable, suggesting that intrapartum amnioinfusion is a relatively safe procedure in cases of meconium-stained liquor, particularly in resource limited secondary care settings.

Discussion

Meconium-stained liquor (MSL) remains an important obstetric concern because of its association with fetal distress, meconium aspiration syndrome (MAS), increased operative deliveries, and neonatal morbidity. In resource limited settings, where advanced neonatal intensive care facilities may not always be available, simple and cost-effective interventions such as intrapartum amnioinfusion can play an important role in improving maternal and neonatal outcomes. The present prospective study was conducted to evaluate the role of intrapartum amnioinfusion in cases of meconium-stained liquor at a secondary care hospital.

In the present study, the majority of women belonged to the age group of 20–25 years in both groups, and most cases were between 37–40 weeks of gestation. Primigravidae constituted the majority of the study population. The majority of women in both groups underwent induced labor, and most had cervical dilatation between 4–7 cm at the time of meconium detection. Comparable labor characteristics between the groups reduced selection bias and strengthened the reliability of the observed outcomes. One of the important findings of the present study was the reduction in operative delivery rates among women who received amnioinfusion. The LSCS rate was lower in the amnioinfusion group (18%) compared to the non-amnioinfusion group (30%). Similar findings were observed in studies by Gehlot et al. (14% vs 22%) [8], Mistri et al. (9% vs 17%) [9], and Asnani et al.(35% vs 60%)[10]. The reduction in cesarean section rates may be attributed to decreased cord compression, dilution of thick meconium, and improvement in fetal heart rate patterns following amnioinfusion.

Increased vaginal delivery rates are particularly beneficial in secondary care and resource-limited settings, where reducing operative morbidity and healthcare burden is important.

Table

LSCS rate in all Studies	Group A	Group B
Present study	18%	30%
Gehlot et.Al.	14%	22%
Mistri et.A.	9%	17%
Asnani et.Al.	35%	60%

The amnioinfusion to delivery interval findings in the present study also suggest improved labor progress in the amnioinfusion group. A greater proportion of women in Group A delivered within 1–4 hours, whereas prolonged delivery intervals (>4 hours) were more common in the non amnioinfusion group. This suggests that intrapartum amnioinfusion may contribute to better labor outcomes and reduced prolongation of labor. Neonatal outcomes were also comparatively better in the amnioinfusion group. The majority of neonates in Group A were asymptomatic at birth (72%) compared to Group B (64%). The need for neonatal resuscitation, NICU admission, and referral for MAS was lower in the amnioinfusion group. NICU admissions were observed in 18% of neonates in Group A compared to 26% in Group B. Referral for MAS was also lower in Group A (8%) than Group B(12%). These findings indicate that amnioinfusion may reduce neonatal morbidity associated with meconium-stained liquor. In the present study, Apgar scores at 1 minute were better in the amnioinfusion group, with 78% neonates having Apgar scores >7/= compared to 70% in the non-amnioinfusion group. Neonates with Apgar scores <7 were fewer in Group A (22%) compared to Group B (30%). Similar improvements in Apgar scores following amnioinfusion were reported by Asnani et al. and Vachhani et al.[11].

Table

Apgar score<7	Studies	Group A	Group B
	Present study	22%	30%
	Asnani et.Al.	32.5%	55%
	Vachhani et.Al.	14%	23%
Apgar score>/=7	Present study	78%	70%
	Asnani et. Al.	67.5%	45%
	Vachhani et. Al.	86%	77%

The incidence of meconium aspiration syndrome was also lower in the amnioinfusion group. In the present study, MAS occurred in 8% of neonates in Group A compared to 12% in Group B, which is comparable to findings by Mistri et al. (1% vs 2%). Other studies such as Gehlot et al., Vachhani et al., and Asnani et al. also demonstrated lower rates of MAS in the amnioinfusion group. The likely mechanism is dilution of thick meconium and reduction in fetal gasping secondary to decreased cord compression and fetal distress.

Table

Meconium aspiration syndrome in all the studies	Group A	Group B
Present study	8%	12%
Mistri et.Al.	1%	2%
Gehlot et. Al.	4%	23%
Vachhani et. Al.	5%	15%
Asnani et. Al.	10%	30%

Maternal complications associated with amnioinfusion in the present study were minimal. These findings suggest that intrapartum amnioinfusion is a relatively safe procedure when performed with appropriate monitoring and aseptic precautions. Similar safety profiles have been reported in previous studies. In the present study, neonatal mortality was comparable in both groups, with one neonatal death in each group (0.5%). Similar findings were reported by Mistri et al. (1% vs 2%) and Gehlot et al. (1% vs 7%), which also showed lower mortality in the amnioinfusion group. Although neonatal mortality was not significantly different in our study, overall neonatal morbidity was lower in the amnioinfusion group, supporting the beneficial role of intrapartum amnioinfusion in meconium-stained liquor.

Conclusion

The present study demonstrates that intrapartum transcervical amnioinfusion is a simple, safe, and effective intervention in cases of meconium-stained amniotic fluid. Amnioinfusion was associated with a reduction in cesarean section rates, improved chances of vaginal delivery, shorter delivery intervals, and better neonatal outcomes, including reduced need for neonatal-resuscitation, lower NICU admissions, and fewer cases of meconium aspiration syndrome. Maternal complications related to the procedure were minimal and manageable.

These findings suggest that intrapartum amnioinfusion can be a valuable and cost-effective strategy for improving fetomaternal outcomes in resource limited secondary care hospitals where advanced neonatal intensive care facilities may not be readily available.

Limitations of the Study

1. The study was conducted at a single secondary care hospital with a relatively small sample size, which may limit the generalisability of the findings.
2. Randomisation was not performed, as the groups were formed based on patient consent for amnioinfusion, which may introduce selection bias.
3. Long-term neonatal follow-up was not conducted; therefore, long-term neurodevelopment outcomes could not be assessed.
4. The study included only term singleton pregnancies with cephalic-presentation, so the results may not be applicable to preterm pregnancies or high-risk obstetric cases.

References

1. Gallo DM, Romero R, Bosco M, Gotsch F, Jaiman S, Jung E, Suksai M, Ramón Y Cajal CL, Yoon BH, Chaiworapongsa T. Meconium-stained amniotic fluid. Am J Obstet Gynecol. 2023 May;228(5S):S1158-S1178. doi: 10.1016/j.ajog.2022.11.1283. Epub 2023 Apr 1. PMID: 37012128; PMCID: PMC10291742.
2. Avery GB, Fletcher MA, MacDonald MG, editors.Neonatology. pathophysiology and management of the newborn. 4th ed. Philadelphia: Lippincott,1994.
3. Nathan L, Levino KJ, Carmody TJ 3rd, Kelly MA, Sherman ML. Meconium: a 1990s perspective on an old obstetric hazard. Obstet Gynecol 1994;83:329-32.
4. Mathews TG, Warshaw JB. Relevance of the gestational age distribution of meconium passage in utero. Pediatrics 1979;64:30-1.
5. Kashikar S, Kotpalliwar MK, U&awar PR. Meconium-stained liquor and its impact on maternal and neonatal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2021 Apr 1;10(4):1629-37.
6. Rao KS, Pathapati S, Vansipriya C. Risk factors for meconium stained liquor and outcome of neonate in meconium stained amniotic fluid [Internet]. Indian J Obstet Gynecol Res. 2017 [cited 2026 May23];4(1):1-5. Available from: https://doi.org/.
7. Hofmeyr GJ. Amnioinfusion for meconium-stained liquor in labour. Cochr Database Syst Rev. 2002;(1).
8. Dr. Neetu Gehlot, et. al. “Study Of Intrapartum Amnioinfusion For Meconium Stained Liquor. ”IOSR Journal of Dental and Medical Sciences(IOSR-JDMS), 20(06), 2021, pp. 34-38.
9. Mistri P, Halder A, Konar H. Role of Amnioinfusion among the Women in Labour with Meconium Stained Liquor. Journal of Dental and Medical Sciences. 2019;18(1):01-4.
10. Asnani M, Singh S, Srivastava K, Gupta HP, Mittal A. Role of amnioinfusion inmeconium stained liquor in relation to fetal outcome.Int J Reprod Contracept Obstet Gynecol 2016;5:175-81.
11. Vachhani AD, Shah JM, Goel GS, Mehta MN, Desai AI, Dalal MT. Intrapartum Amnioinfusion in Meconium Stained Amniotic Fluid- A Randomized Control Study In a Tertiary Care Hospital. Ntl J of Community Med 2015; 6(3):442-444.