

# Frequency of Meconium-stained Amniotic Fluid in COVID-positive Term Pregnancies and Perinatal Outcome

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## ABSTRACT

**Aim:** To know the frequency of meconium-stained amniotic fluid (MSAF) among COVID-positive term pregnant mothers and to know perinatal outcomes in these neonates.

**Materials and methods:** A retrospective study was conducted of COVID-positive term pregnancies admitted to Vanivilas hospital, Bangalore Medical College, during the study period of 1 year. The study period was from 1st of July 2020 to 31st of June 2021. High-risk pregnancies that confound the occurrence of MSAF were excluded (obstetric risk factors and medical risk factors complicating pregnancy). Data were collected from medical records of patients and parturition register, which are cross-verified with operation theater records and neonatal intensive care unit (NICU) registers.

**Results:** In total, 200 pregnant women were included in the study. About 65% were delivered by cesarean, 34.5% by the vaginal route, and one vacuum-assisted delivery. In total, 199 live births and one fresh stillbirth are reported. About, 26% had MSAF and 6.5% of newborns had meconium aspiration syndrome. Grade I, II, and III cases were 4.5%, 12.5%, and 9% respectively. Low appearance, pulse, grimace, activity, and respiration (APGAR) scores were correlating with the grade of MSAF, which is statistically significant. There were two neonatal deaths in grade III MSAF cases.

**Conclusion:** The frequency of MSAF is increased among COVID-positive mothers, which translates to low APGAR scores and poor perinatal outcomes. Vigilant intrapartum care is recommended for these pregnancies to reduce the risk of poor neonatal outcomes.

**Clinical significance:** The current study is undertaken to know if coronavirus disease-2019 (COVID-19) is associated with an increased frequency of MSAF among COVID-positive pregnant women. Finding MSAF has implications on operative delivery, cesarean rates, and perinatal outcome. There is a lack of studies about MSAF and perinatal outcomes in COVID-positive mothers. Evidence generated by this study helps to counsel the COVID-positive mothers and guides in the management of COVID-positive laboring women.

**Keywords:** COVID-positive pregnancy, Meconium-stained amniotic fluid, Perinatal outcome.

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## INTRODUCTION

The current novel Corona pandemic has been a major health challenge, particularly to pregnant women and newborns. There is an increased risk of preterm labor (12.9%), small for gestation (SGA), and fetal distress, among COVID-positive women which contribute to poor neonatal outcome.<sup>1,2</sup> Changes during pregnancy like reduced functional residual volumes, diaphragm elevation, edema of respiratory tract mucosa, as well as changes in cell immunity can lead to increased susceptibility to viral infections and can have worsened outcomes both for mother and baby.<sup>3</sup>

Meconium passage is usually seen secondary to fetal hypoxia.<sup>4-6</sup> Meconium aspiration syndrome (MAS) resulting from MSAF is one of the significant causes of neonatal mortality.<sup>7</sup> Many studies have shown that MSAF is associated with a high risk of fetal distress, operative delivery, and increased incidence of perinatal morbidity and mortality.<sup>7-9</sup>

COVID-19-positive laboring mothers have a higher risk of having MSAF (23.63%), babies born with respiratory distress (10.5%), moderate-to-severe hypoxic ischemic encephalopathy (HIE) (3.6%), and sepsis (7%).<sup>10</sup> Increased risk of low birth weight of 14.3% and intrauterine growth restriction (IUGR) is also common.<sup>1,11</sup> Pyrexia in the mother secondary to COVID-19 and associated viremia may lead to increased cases of MSAF in these women in labor, which lead to higher rates of operative intervention and perinatal mortality.

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The current study is undertaken to know if COVID-19 is associated with an increased frequency of MSAF among COVID-positive pregnant women. Finding MSAF has implications on operative delivery, cesarean rates, and perinatal outcome. There is a lack of studies about MSAF and perinatal outcomes in COVID-positive mothers. Evidence generated by this study helps to counsel the COVID-positive mothers and guides in the management of COVID-positive laboring women.

## MATERIALS AND METHODS

This is a hospital-based, retrospective cross-sectional study conducted at the Department of OBG at Vanivilas hospital, attached

to Bangalore Medical College and Research Institute, a tertiary care medical college and a dedicated COVID care center for pregnant mothers. Data were collected from 1st of July 2020 to 31st of June 2021 (12 months). Permission was taken from the Institutional Review Board.

Data were collected from medical records of patients and parturition register, which are cross-verified with operation theater records and NICU registers. The required data were collected in a predesigned data-entry form, including demographic information gestational age, parity, maternal clinical characteristics, medical and obstetric complications during pregnancy, color of the liquor, grades of meconium, mode of delivery, birth weight, and neonatal outcome (APGAR score, type of resuscitation, MAS, and need for admission in the nursery), which were recorded.

Inclusion criteria – COVID-positive mothers, term pregnancy (37–41 weeks), admitted in spontaneous labor.

Exclusion criteria – Induced labor, Obstetric risk factors—preterm (less than 37 weeks), post-dated pregnancy (more than 41 weeks), multiple pregnancies, antepartum hemorrhage, IUGR, oligohydramnios, breech presentation, and macerated stillbirth. Medical disorders complicating pregnancy are commonly associated with MSAF like gestational/pregestational hypertensive disorders of pregnancy and gestational/pregestational diabetes.

### Case Definition

COVID-positive pregnant women with a positive report on either real-time polymerase chain reaction COVID-19 detection kit or rapid test (SARS-CoV-2 antigen detection rapid kit) as recommended by the Indian Council for Medical Research, both symptomatic and asymptomatic are included.

Term pregnancy—37–41 weeks confirmed by last menstrual period (LMP), examination, and obstetric ultrasound correlation.

Hypertensive disorders in pregnancy and gestational diabetes—increased blood pressure of more than or equal to 140/90 and glucose tolerance test of more than 140 mg/dL, respectively, as per case definition by William’s Obstetrics textbook.<sup>12</sup>

Intrauterine growth restriction (IUGR) and oligohydramnios—clinical suspicion and confirmed by USG or birth weight less than 2.5 kg.

Post-dated/prolonged pregnancy—more than 41 weeks.

Labor—presence of uterine contraction with progressive cervical effacement and dilatation diagnosed by an obstetrician.

Meconium-stained amniotic fluid (MSAF)—Grade I (non-significant)—lightly yellow-stained amniotic fluid. Grade II or grade III (significant)—yellow or green turbid fluid with flakes or greenish-yellow thick tenacious, pasty amniotic fluid, respectively.

Meconium aspiration syndrome (MAS)—presence of meconium-stained liquor, staining of skin or umbilical cord or meconium in the trachea at birth, followed subsequently by signs and symptoms of MAS (tachypnea, dyspnea, retraction, grunting, or cyanosis).

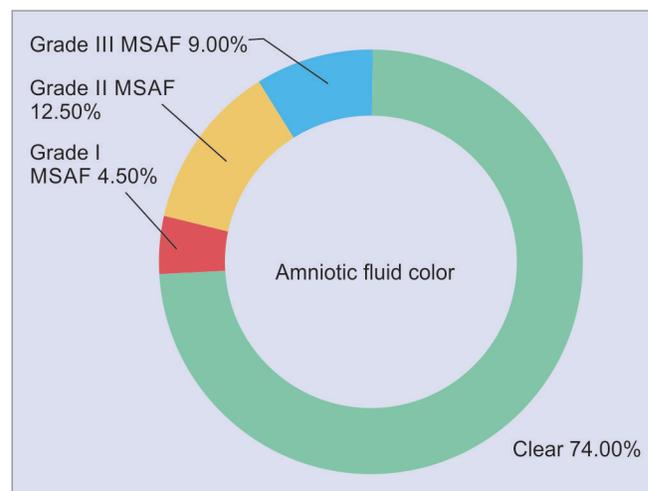
APGAR—Appearance, Pulse, Grimace, Activity, and Respiration recorded at 1 minute and 5 minutes after delivery.

Hypoxic ischemic encephalopathy (HIE) of the newborn—a syndrome due to inadequate oxygenation during the time of birth, resulting in low APGAR, and seizures. It was classified as mild, moderate, and severe as per Sarnat<sup>13</sup> staging. It was recorded in case records by a pediatrician.

Stillbirth—an absence of signs of life at birth. Macerated includes intrauterine fetal demise with features of maceration. If

**Table 1:** Distribution of mode of delivery

Mode of delivery	Frequency	Percent
Cesarean delivery	130	65.0
Vaginal delivery	69	34.5
Vacuum-assisted	01	0.5
Total	200	100.0



**Fig. 1:** Color of liquor and frequency of MSAF as per grades

features of maceration are absent, it is considered as fresh stillborn. It was documented in case records by the obstetrician.

### Statistical Analysis

Data were analyzed by SPSS standard version 20. The results for continuous variables like gestation age are expressed as mean ± standard deviation (SD). Frequency and percentage are calculated for categorical variables like mode of delivery, parity, APGAR score, and neonatal outcomes. The Chi-square test is applied between grades of meconium and APGAR score at 95% confidence interval, and the *p*-value <0.05 was considered to be statistically significant.

### RESULTS

After applying inclusion and exclusion criteria, 200 COVID-19-positive pregnant women were included in our study.

The majority of pregnant women were aged between 21 and 25 years (90 women), followed by 26 and 30 years (66 women), and 31 and 33 years (44 women). In total, 94 out of 200 women were primi (1st pregnancy), 74 women were para 1, and 31 women were para 2. In total, 86 out of 200 women were cases of previous lower segment cesarean section (LSCS) in early labor.

In total, 199 out of 200 women belong to gestational age 37–40 weeks and only one case of 41 weeks of pregnancy. The mean gestation age in the study group is 39 ± 0.96.

The common mode of delivery was cesarean delivery, 130 vs 70, as shown in Table 1. One vacuum-assisted delivery was done for fetal distress for the MSAF case.

Meconium-stained amniotic fluid (MSAF) was seen in 52 patients out of 200 COVID-19-positive pregnancies. Among MSAF, grade I was seen in 9, grade II in 25, and grade III in 18 pregnancies, as depicted in percentages in Figure 1.

**Table 2:** Perinatal outcome among COVID-positive mothers

Causes	Number 200 cases (%)
Live births	199 (99.5%)
MSAF	52 (26%)
Meconium aspiration syndrome	13 (6.5%)
Hypoxic ischemic encephalopathy (HIE)	12 (6%)
Neonatal death	02 (1%)
Fresh stillbirth (intrapartum)	01 (0.5%)

**Table 3:** Correlation of grades of MSAF with Apgar at 1 minute\*

Grade		Apgar 1			Total
		4-6	7-10	Dead	
Grade I	Count	0	8	0	8
	% of total	0.0%	4.0%	0.0%	4.0%
Grade II	Count	3	22	0	25
	% of total	1.5%	11.0%	0.0%	12.5%
Grade III	Count	5	11	2	18
	% of total	2.5%	5.5%	1.0%	9.0%
Clear liquor	Count	3	146	0	149
	% of total	1.5%	73.0%	0.0%	74.5%
Total	Count	11	187	2	200
	% of total	5.5%	93.5%	1.0%	100.0%

\*p-value = 0.000 (<0.05), association is statistically significant

**Table 4:** Correlation of grades of MSAF with Apgar at 5 minutes\*

Grade		Apgar 5		Total
		7-10	Dead	
Grade I	Count	8	0	8
	% of total	4.0%	0.0%	4.0%
Grade II	Count	25	0	25
	% of total	12.5%	0.0%	12.5%
Grade III	Count	16	2	18
	% of total	8.0%	1.0%	9.0%
Clear liquor	Count	149	0	149
	% of total	74.5%	0.0%	74.5%
Total	Count	198	2	200
	% of total	99.0%	1.0%	100.0%

\*p-value = 0.000 (<0.05), association is statistically significant

Perinatal outcome is described in Table 2: MAS seen in 13 babies. In total, there were 2 cases of neonatal death among 13 MAS babies. In total, 199 were live births and one fresh stillbirth in LSCS done for fetal distress.

Tables 3 and 4 show a correlation of grades of MSAF with APGAR at 1 and 5 minutes. Appearance, pulse, grimace, activity, and respiration (APGAR) score was seen well correlating with grades of MSAF at 1 and 5 minutes. A low APGAR score is seen with higher grades of MSAF, which was statistically significant. There were two neonatal deaths in grade III MSAF.

## DISCUSSION

It is important to apply evidence-based clinical decisions in this pandemic. Royal College of Obstetricians and Gynaecologists

(RCOG) and Centers for Disease Control and Prevention (CDC) have reported that COVID-positive pregnant women may have risk of severe illness and fetal complications like stillbirth, SGA, and preterm labor.<sup>1,14</sup> PRIORITY study published a preliminary report in 2021 with the conclusion that adverse neonatal outcomes like preterm birth, respiratory disease, or NICU admission did not differ among COVID-positive mothers compared with COVID-negative mothers.<sup>15</sup> Our study intended to know the frequency of MSAF which can result in an adverse perinatal outcome, among COVID-positive mothers.

A study was done at Bangalore Medical College, which is a premier public teaching hospital, catering to low and middle socioeconomic groups of patients. A dedicated COVID block was reserved for corona cases, including pregnant women. A study was conducted for a period of 1 year, which excluded high-risk confounding risk factors for meconium. However, previous cesarean scar pregnancies were included in the study.

In the current study group, the main mode of delivery was cesarean, 65% vs 34.5%. As cases of previous cesarean were included in the study group, cesarean rates are higher. Ignorance during initial phases of the pandemic regarding the COVID-19 transmission, fear of long-hour exposure of healthcare providers during normal labor, also contributed to increased cesarean rates. Studies by Zaigham<sup>16</sup> and Nayak<sup>10</sup> had cesarean delivery rates of 90% and 60%, respectively, which are higher than the current study. However, these studies included all pregnancies including medical and obstetric risk factors (for example – hypertensive disorders, malpresentation, oligohydramnios, etc.). Also, those studies were done during the initial phases of the pandemic. There was one instrumental delivery that indicated fetal distress with MSAF with fresh stillbirth.

Our study results show that the frequency of MSAF is increased among COVID-positive pregnant mothers, about 26% vs background risk of about 10–18% in COVID-negative mothers.<sup>4,17</sup> Meconium-stained amniotic fluid (MSAF) may result from pyrexia associated with COVID-positive status or the associated viremia. Nayak et al.<sup>10</sup> in their study of neonatal outcomes in COVID-positive mothers concluded that MSAF was seen in 23.63% of cases, which is comparable to the current study. Appearance, pulse, grimace, activity, and respiration (APGAR) scores correlated with grades of meconium with lower scores were seen with grade III MSAF, which was statistically significant. The study by Masood et al.<sup>5</sup> concluded that lower APGAR scores are associated with MSAF, more so in primiparous women.

One stillbirth and two neonatal deaths (within 30 minutes) of birth were all associated with MSAF. This outcome was comparable to other studies. A systematic review by Wei<sup>18</sup> showed an increased risk of stillbirth among COVID-positive mothers with odds ratio of 2.11 (OR 2.11, 95% CI 1.14–3.90). A review of 108 pregnancies by Zaigham<sup>16</sup> has reported one neonatal and one intrauterine death. Five neonatal deaths (3%) were reported by a study from India.<sup>10</sup> There were no neonatal deaths reported by another study from India, according to Naveen Chandra et al.<sup>11</sup>

The risk of HIE in the current study is 6% higher than the study by Nayak et al.<sup>10</sup> with 3.6%, as only moderate-to-severe HIE was included in the comparison trial. The current study included all HIE cases as recorded by the pediatrician in case records, as per Sarnat's classification.<sup>13</sup> Kapadia et al. reported 8% mild-birth asphyxia requiring ICU admission, comparable to our study.<sup>19</sup>

The strengths of the study were to exclude women with confounding risk factors for MSAF and report the frequency of

meconium in COVID-positive pregnancies. The limitations are: retrospective design, does not establish a temporal association of MSAF with COVID-positive status. Both symptomatic and asymptomatic women were included in the study. More studies are required in this field to generate clinical guidelines to manage COVID-positive mothers.

## CONCLUSION

The frequency of MSAF is increased among COVID-positive mothers which translates to low APGAR scores and poor perinatal outcome. Vigilant intrapartum care is recommended for these pregnancies to reduce the risk of poor neonatal outcomes.

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