

Study of maternal risk factors and compare the perinatal outcome in thick and thin meconium stained amniotic fluid

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Abstract

Background: Meconium is the first substance secreted from fetal intestines and consist of intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile and water. Its formation begins around 10-12 weeks of gestation and the quantity goes on increasing as the gestational age advances and it is the post-mature baby who is at a greater risk of passage of meconium in utero and its consequences like meconium aspiration syndrome (MAS). **Aim & Objective:** 1 Study of maternal risk factors and compare the perinatal outcome in thick and thin meconium stained amniotic fluid. 2 study the mode of delivery in a labour complicated by meconium stained amniotic fluid. **Methods: Study design:** Prospective Study. **Study setting:** Department of Obstetrics and Gynaecology, Rohilkhand medical college and hospital Bareilly

Study duration: From November 2022 to November 2023. **Study population:** All meconium stained amniotic fluid patients admitted in our institute during study period included in the study. **Sample size:** 50 **Results:** Majority of cases found in 31-35 years age group 20 cases (40%) followed by above 35 years age group 14 cases (28%), 13 (26%) cases in 26-30 years age group and 4 cases in 18-25 years age group. most of cases found with thin MSAF 24 (48%) followed by moderate thick MSAF 14 (28%) and thick MSAF found in 12 cases (24%). majority of cases presented with post maturity 30 (60%) followed by prolonged labour 31, Anemia 25 cases, IUGR 17, PIH 14 and 8 cases found with oligohydramnios. Most common mode of delivery was LSCS 22 cases followed by AD 18 cases and Normal vaginal delivery observed in 10 cases. majority of cases found Asphyxia 60% followed by meconium aspiration syndrome 12 cases, neonatal pneumonia 8, Early/late onset sepsis 5, persistent pulmonary hypertension found in 4 cases. Mortality 2%. **Conclusion:** Most common maternal risk factor was post maturity, Majority of cases delivered through LSCS, Perinatal Mortality was 2%.

Keywords: Meconium stained amniotic fluid, Maternal risk factors, Perinatal outcome

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Introduction

Meconium is the first substance secreted from fetal intestines and consist of intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile and water.^{1,2} Its formation begins around

10-12 weeks of gestation and the quantity goes on increasing as the gestational age advances and it is the post-mature baby who is at a greater risk of passage of meconium in utero and its consequences like meconium aspiration syndrome.³

Meconium aspiration syndrome is one of the dreadful complications of prolonged labor, fetal hypoxia due to any cause and prematurity. Once the meconium is aspirated by fetus it may cause severe meconium pneumonitis, respiratory distress, acidosis and ultimately respiratory failure⁴. Extensive neonatal care, surfactant therapy and ventilatory management is required for babies developing respiratory distress secondary to meconium aspiration and despite extensive medical care MAS may prove fatal in many cases.⁵

The various hypothesis put forward as the triggering event for in-utero passage of meconium include fetal hypoxia, vagal stimulation causing increased peristalsis and relaxation of anal sphincter and passage of meconium as a consequence of normal gastrointestinal tract maturation as the gestational age advances.⁶

Fetal hypoxia causing increased peristalsis and passage of meconium appears to be plausible as there is increased incidence of passage of meconium in many cases where fetal distress is diagnosed on the basis of fetal bradycardia or abnormal doppler parameters⁷. On the contrary no definite cause is found in many cases where there is meconium staining of amniotic fluid first noted during rupture of membranes.

It is possible that different mechanisms may be at play in different patients. Like in post mature babies increased incidence of meconium stained amniotic fluid may represent maturation of gut while in cases with fetal distress, hypoxia causing increased peristalsis and consequently passage of meconium may be the cause.⁸

Irrespective of the cause of passage of meconium in utero it is important to prevent its aspiration as it will invariably cause pneumonitis, emphysema due to ball valve mechanism, acidosis and in severe cases respiratory failure and neonatal death.⁹ For this pregnancy with post maturity, fetal compromise or fetal distress should be identified in time.¹⁰ Umbilical artery doppler showing absence or reversal of diastolic flow, decrease or loss of fetal movements, fetal bradycardia and fetal scalp blood pH indicative of acidosis are some of the important features which may suggest fetal hypoxia.

In all such cases appropriate measures must be taken to prevent fetal morbidity and mortality.¹¹ Meconium stained amniotic fluid may be a normal phenomenon in post-maturity and has little significance unless it is associated with variations in fetal heart rate and other signs of fetal hypoxia. Nonetheless there are always chances that the fetus may make gasping in-utero more hazardous in presence of meconium stained amniotic fluid.¹²

Unless proper resuscitative measures are taken immediately after the delivery aspiration of meconium may take place which is usually followed by major pathological consequences that include airway obstruction, surfactant dysfunction, chemical pneumonitis and pulmonary hypertension. The consequences of pathological processes may cause secondary complications such as persistent pulmonary hypertension in newborn (PPHN), right to left shunts due to pulmonary hypertension, diffuse pneumonitis due to enzymes, bile salts and free fatty acids present in meconium.

Surfactant dysfunction may result in diffuse atelectasis and airway obstruction may result in hyperinflation, pneumothorax and pneumomediastinum¹³. Maternal risk factors associated with meconium stained amniotic fluid and consequently meconium aspiration syndrome include maternal pathologies such as preeclampsia and eclampsia, anemia, oligohydramnios, prolonged labor, maternal infections such as chorioamnionitis, maternal substance abuse such as tobacco or cocaine and placental insufficiency of any cause.¹⁴

Though meconium aspiration can occur in any gestation complicated or uncomplicated, treating obstetrician must be aware of presence of maternal risk factors so that appropriate preventive and therapeutic measures can be taken in time.¹⁵

Historical background

The word meconium is derived from the Greek word „Meconium arion“ meaning substance that resembles poppy juice or opium, which is greenish in colour. It has also been given another meaning by Aristotle as „Opium like“ as he believed that it induced fetal sleep. John Sim (1817), the English obstetrician and other contemporary workers thought that the presence of meconium in AF during labour was a sign of fetal death in utero.

Schwartz was the first to show (in 1858) that the appearance of meconium during labour meant impending fetal death. He, in a masterly treatise described the clinical situations under which meconium was passed. He suggested that some change in fetal physiology was responsible and stated that “The presence of meconium is always a proof of suppression or reduction of respiratory placental communication and is a reliable sign of death of the fetus or sign of endangerment to the life of fetus during the act of birth”.



Image 1 – Baby with meconium staining



Image 2 – Picture of placenta i.e. meconium stained

Meconium severity grading

Classified into 3 grade

Grade 1: Thin slightly yellow or green meconium, no indication of fetal distress

Grade 2: Moderate thick meconium that is light green or brownish in color, could be an indication of some fetal distress

Grade 3: Thick, pea-soup like meconium that appears brown or black in color, there is an increased risk of fetal distress.

Characteristics of MAS

MAS is characterised by early onset of respiratory distress and hypoxaemia in a meconium-stained term or near-term infant

Causes Meconium Aspiration Syndrome:

Meconium Aspiration Syndrome occurs due to excretion of the meconium before or during delivery, which is breathed into the lungs of the newborn causing symptoms of

respiratory distress. Elimination of meconium into the amniotic fluid before birth occurs as a result of fetal distress or hypoxia.

Conditions which increase the risk of developing Meconium Aspiration Syndrome are:

- Advanced gestational age
- Gestational diabetes in the pregnant mother
- High blood pressure in the pregnant mother
- Chronic respiratory conditions in the pregnant mother
- Cardiovascular conditions in the pregnant mother
- Prolonged labor / difficult delivery
- Reduced blood/ oxygen supply to the infant while in the uterus
- Abnormalities of the umbilical cord
- Poor growth of the fetus in the womb.



Aim and Objective

1. Study of maternal risk factors and compare the perinatal outcome in thick and thin meconium stained amniotic fluid.
2. To study the mode of delivery in a labour complicated by meconium stained amniotic fluid.

Methodology

Study design: Prospective Study.

Study setting: Department of Obstetrics and Gynaecology, Rohilkhand medical college and hospital Bareilly

Study duration: From November 2022 to November 2023

Study population: All meconium stained amniotic fluid patients admitted in our institute during study period included in the study.

Sample size: 50

Inclusion criteria

1. All meconium stained amniotic fluid patients admitted in our institute during study period included in the study.

2. Term labour (>37 completed weeks)
3. Cephalic presentation.
4. Live singleton pregnancy

Exclusion Criteria

1. Antepartum haemorrhage
2. Malpresentations
3. Pregnancy with congenital malformations.
4. Intrauterine death
5. Not willing to participate

Approval for the study:

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY department was obtained. After obtaining informed verbal consent from all study participants such cases were included in the study.

Sample size: 50

Sampling technique:

Convenient sampling technique used for data collection. All patients admitted in OBGY ward of tertiary care center from November 2022 to November 2023 with meconium stained.

Methods of Data Collection and Questionnaire-

Pre-designed and pre-tested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, Medical history- chief complain, past history, general examination, systemic examination.

Menstrual history: LMP, EDD, Obstetrics history-marriage duration, parity, Mode of delivery, maternal complications, Type of meconium, No ANC visits, Gestational age at the time of admission, Mode of delivery, Maternal Outcome, Maternal complications, perinatal outcome, perinatal complication.

A detailed history was taken with a special emphasis on associated maternal risk factors like pre-eclampsia, gestational diabetes, history of fever and substance abuse. Ultrasound reports were studied and any abnormality like oligohydramnios or polyhydramnios was noted down. Method of delivery like vaginally, forceps delivery or LSCS was noted. General and systemic examination was done.

Obstetrical examination was done noting the presentation, position, height of fundus, amount of amniotic fluid, fetal heart rate, uterine contraction, pelvic status. When MSAF appeared along with rupture of membrane it was collected and clinically graded thorough and quick vaginal examination was done to assess the state of cervix, station of fetal head, and exclusion of cord prolapse and to note the colour and consistency of AF.

MSAF was collected by introducing Sim's speculum under aseptic precaution and material taken into a clear test tube for clinical gradation according to the colour and consistency.

When AF was thinly stained with greenish yellow in colour, it was graded as thin meconium stained. When AF was dark green or tarry black or muddy in colour and of thick consistency it was considered as thick meconium stained.

Study cases were grouped into thin and thick meconium stained amniotic fluid group on the basis of consistency of meconium. APGAR scores at 1 and 5 minutes, Weight and gender of the newborns was noted. All the babies delivered were kept under observation for 24hours. Babies who were normal and did not develop any complications within 24hours after birth were placed mother-side.

Babies who developed any sign of respiratory distress within 24hours were shifted to NICU. Babies who initially were shifted to mother and developed signs of respiratory distress were also transferred to NICU. Babies were followed-up up to 7 day and their clinical condition was assessed and any abnormalities were recorded. Death and its cause during hospital stay within first week of neonatal life were also recorded

Complete investigation done, Usg, Complete haemogram, Blood electrolyte, Blood biochemistry, Blood culture, Blood gas analysis, Chest X-ray. Proforma of meconium stained notes maintained.

Result And Observations

This prospective study was conducted among 50 cases of meconium stained AF admitted in OBGY department during study period.

Table No.1: Distribution of study participants as per age (n=50)

Age (in Years)	Frequency	Percentage
18-25	3	6%
26-30	13	26%
31-35	20	40%
>35	14	28%
Total	50	100%

The above table shows majority of cases found in 31-35 years age group 20 cases (40%) followed by above 35 years age group 14 cases (28%), 13 (26%) cases in 26-30 years age group and 4 cases in 18-25 years age group.

Table No.2: Distribution of cases as per type of meconium stained amniotic fluid

MSAF	Frequency	Percentage
Thin	24	48%
Moderate thick	14	28%
Thick	12	24%
Total	50	100%

The above table shows majority of cases found with thin MSAF 24 (48%) followed by moderate thick MSAF 14 (28%) and thick MSAF found in 12 cases (24%).

Table No.3: Maternal risk factors with meconium stained amniotic fluid

Maternal risk factors	Frequency	Percentage
Post maturity	30	60%
Pregnancy induced hypertension	14	28%
Anemia	25	50%
IUGR	17	34%
Oligohydramnios	08	16%
Prolonged labour	31	62%
Multiple risk factor	18	36%

The above table shows majority of cases presented with post maturity 30 (60%) followed by prolonged labour 31, Anemia 25 cases, IUGR 17, PIH 14 and 8 cases found with oligohydramnios.

Table No.4: Distribution of cases as per mode of delivery

Mode of delivery	Frequency	Percentage
LSCS	22	44%
NVD	10	20%
AD	18	36%
Total	50	100

The above table shows majority of cases mode of delivery were LSCS 22 cases followed by AD 18 cases and Normal vaginal delivery observed in 10 cases.

Table No.5: Distribution of cases as per Need for resuscitation

Need for resuscitation	Frequency	Percentage
Resuscitation required	30	60%
Resuscitation not required	20	40%
Total	50	100%

The above table shows majority of cases required resuscitation 60% and 40% cases not required resuscitation.

Table No.6: Morbidity in neonates born with meconium stained amniotic fluid

Morbidity	Frequency	Percentage
Asphyxia	30	60%
Meconium aspiration syndrome	12	24%
Neonatal pneumonia	9	18%
Persistent pulmonary hypertension	4	8%
Early/ late onset sepsis	5	10%

The majority of cases found Asphyxia 60% followed by meconium aspiration syndrome 12 cases, neonatal pneumonia 8, Early/late onset sepsis 5, persistent pulmonary hypertension found in 4 cases.

Table No.7: Outcome in neonates born with meconium stained amniotic fluid

Outcome	Frequency	Percentage
Discharged	42	84%
DAMA	07	14%
Death	01	2%
Total	50	100%

The above table shows majority of cases discharged 42 followed by 7 cases DAMA and 1 case death during treatment.

Discussion

This prospective observational study was conducted among 50 cases of meconium stained AF admitted in OBGY department during study period

In current study majority of cases found in 31-35 years age group 20 cases (40%) followed by above 35 years age group 14 cases (28%), 13 (26%) cases in 26-30 years age group and 4 cases in 18-25 years age group. Niranjana KS et al (2019)¹⁶ Reported most common age group in cases was more than 21-25 years (36.5%) followed by 26-30 years (29.5%).

In current study majority of cases found with thin MSAF 24 (48%) followed by moderate thick MSAF 14 (28%) and thick MSAF found in 12 cases (24%). K. Subba Rao et al¹⁷ He found that the Out of the 100 cases delivered, 45% were with thin meconium stained amniotic fluid and 55% cases were with thick meconium stained amniotic fluid.

In current study most of cases presented with post maturity 30 (60%) followed by prolonged labour 31, Anemia 25 cases, IUGR 17,PIH 14 and 8 cases found with oligohydramnios. Niranjana KS et al¹⁶ Reported that 45 (22.5%) women had no risk factors. Most common single risk factor associated with MSAF was found to be prolonged labour (16.5%) followed by Oligohydramnios (16%) post maturity (12.50%) and PIH (11%). In 14.50% of women

with MSAF multiple risk factors were present compared to 2.5 % of women who had clear liquor which showed statistical significance.

In current study most of cases mode of delivery were LSCS 22 cases followed by AD 18 cases and Normal vaginal delivery observed in 10 cases. Mohan M et al¹⁸ he reported that the most of cases delivered through LSCS (45%). Similar result observed in the study of Niranjan KS et al¹⁶ he found that the most common mode of delivery in meconium stained amniotic fluid was by LSCS (62.50%) followed by normal vaginal delivery (22.00%) and vacuum/forceps assisted delivery (15.50%)

In current study Majority of cases required resuscitation 60 and 40 cases not required resuscitation. Similar finding observed in the study conducted by Niranjan KS et al¹⁶ found that the 40 Neonates born through thick meconium stained amniotic fluid needed some form of resuscitative measures including endotracheal intubation and IPPV (10%), intubation and suctioning (5.00%), bag and mask ventilation (3%) . Only Oxygen inhalation was needed in 4 (2%) neonates. In babies born through thin meconium stained amniotic fluid 30 neonates required either oxygen inhalation or some form of resuscitation.

In current study majority of cases found Asphyxia 60% followed by meconium aspiration syndrome 12 cases, neonatal pneumonia 8, Early/late onset sepsis 5, persistent pulmonary hypertension found in 4 cases. Similar result found in the study by Niranjan KS et al¹⁶ he reported that the Morbidities associated with meconium stained amniotic fluid included birth asphyxia (19.50%) followed by meconium aspiration syndrome (14%), Hypoxic ischemic encephalopathy (12.00%) and sepsis (07.50%). In control group Asphyxia (10%), sepsis (8.50%) and neonatal pneumonia (3.50%) were commonly seen morbidities.

In current study majority of cases discharged 42 followed by 7 cases DAMA and 1 case death during treatment. Debidas et al¹⁹ have reported similar perinatal mortality figures (3%).

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