

# Meconium-Stained Amniotic Fluid during Labour and Fetal Outcomes

Afshan Gul<sup>1</sup>, Shahzadi Neelam<sup>2</sup>, Jawairiah Liaqat<sup>3</sup>

<sup>1</sup>Trainee Medical Officer Obs & Gynae, Qazi Hussain Ahmad Medical Complex Nowshera

<sup>2</sup>Professor Gynae/Obs, Qazi Hussain Ahmad Medical Complex Nowshera

<sup>3</sup>Assistant Professor, Obstetrics and Gynecology Department, Islam Medical College, Sialkot

## Correspondence: Dr. Afshan Gul

Trainee Medical Officer Gynae /Obs unit,

Qazi Hussain Ahmad Medical Complex Nowshera

afshangull1708@gmail.com

## Abstract

**Objectives:** To determine the frequency of adverse fetal outcomes in labour with meconium stained amniotic fluid (MSAF).

**Methodology:** This descriptive series study was conducted at Department of Gynaecology and Obstetrics, Qazi Hussain Ahmad Medical Complex Nowshera, Pakistan from Sept 2022 to March 2023. A total of 115 pregnant women with a term (>37 weeks gestation), singleton, uncomplicated pregnancy with cephalic presentation going through labour induction and had MSAF were enrolled in the study through consecutive sampling. Presence of meconium staining was noted and recorded with its details. Primary outcomes were set as fetal outcomes in terms of 1 & 5 minutes Apgar score < 7, MAS, fetal distress, birth asphyxia, NICU admission and still birth. Daily follow up was done and a final follow up visit in OPD was made after 2-week time. Descriptive analysis was done by applying frequency and percentage.

**Results:** The mean age in this study was 29.6±5.35 years with an age range of 19-40 years while the Mean±SD of gestation was 39.73±1.27 weeks. Apgar< 7 at 1 min was observed in 29 (25.21%) patients, Apgar< 7 at 5 min was observed in 12 (10.43%) patients while MAS was observed in 12 (10.43%) of the patients. Other adverse fetal outcomes include fetal distress 28 (24.34%), asphyxia 15 (13.04%), NICU admission 28 (24.34%) and still birth 3 (2.6%). The incidence of adverse fetal outcomes was found more in patients with thick MSAF.

**Conclusion:** MSAF leads to adverse fetal outcomes. Diagnosing the presence and degree of meconium staining will help in optimal management and will reduce the adverse fetal outcomes during labour.

**Keywords:** Apgar score, Fetal outcomes, Meconium aspiration syndrome, Meconium stained amniotic fluid.

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## Introduction

An odorless black-green material present in fetal intestine is named as meconium. Meconium mainly consists of water, lanugo, mucous, epithelial cells and bile. Passage of meconium is a biological process which is set to occur from 24 to 48h after birth. Although, rarely observed before 37 weeks of gestation, however, as the gestational age increases the chances of passing the meconium by the fetus raises and hence the risk of meconium-stained amniotic fluid (MSAF) increases.<sup>1,2</sup> Different studies have mentioned the prevalence of MSAF between 7 to 22% .<sup>3,4</sup>

No clear cause of MSAF is available however different articles have mentioned placental insufficiency, post

term pregnancy, oligohydramnios, prolonged labour, lower birth weight, IUGR or medical conditions like anemia, pre-eclampsia, maternal hypertension, cholestasis as contributing risk factors. Sociodemographic factors like maternal age, smoking and drug abuse (like cocaine) are also mentioned as predisposing factors.<sup>1,5,6</sup>

The process of MSAF is explained from the compression of umbilical cord that triggers the vagal stimulation or spinal cord compression leading to a hypoxic stress on fetus. This stress causes peristalsis and results in relaxing of anal sphincter and intrauterine meconium passage ultimately occurs.<sup>5</sup>

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Amniotic fluid is mentioned as important indicator of fetal outcome during labour. At the time of membrane rupture, the color of amniotic fluid along with its time of presentation and consistency are key marker. If there is a bit greenish or yellowish coloration in amniotic fluid, we can assess that only a little amount of meconium is diluted in the amniotic fluid, which is mentioned as thin or Grade-I. In Grade 2 or moderate, there is khaki color, indicating that a considerable amount of meconium has stained the amniotic fluid. When there is heavy staining of meconium the appearance is “brown gravy” or a “peasoup” indicating a thick staining of amniotic fluid or Grade III.<sup>7,8</sup>

This meconium is aspirated by the fetus in utero or with the first breath causing an airway obstruction. The process leads to tachypnea, grunting, retractions and cyanosis. Hence the biggest risk involved with MSAF is the incidence of meconium aspiration syndrome (MAS). MAS is defined as development of respiratory distress shortly after birth which can't be explained by any other cause.<sup>9</sup> MAS is reported in 5% of total MSAF cases and then said to be responsible for 27.3% of the total neonatal deaths during delivery.<sup>3,4,10</sup>

Among the 10 nations which shares 2/3 of global neonatal deaths, Pakistan is ranked as 3rd country. The mortality rate per 1000 live births is reported here as 49.<sup>3,11</sup> As per reported in a study conducted in Pakistan regarding MAS, the frequency of MAS is much higher in Pakistan than the developed countries and was reported in 17.4% of the cases. The mortality rate related to MAS was up to 14% in one study and even as high as 32% in the other study.<sup>10,12</sup> This MSAF is thus the indicator of risk for morbidity and mortality for the infant and a thick staining of amniotic fluid is linked to an emergency consideration for cesarean deliveries.<sup>13</sup> In short, MSAF leads to higher risks of fetal distress, respiratory distress, higher rates of newborn resuscitation, low Apgar score, sepsis and low birth weight. There are increased need for neonatal ICU admissions and increased rate of neonatal deaths. MSAF is related to the higher need for instrumental deliveries including cesarean sections. The incidence of perinatal mortality becomes higher due to MSAF even in those pregnancies where risk of obstetric complications was otherwise calculated as low.<sup>14,15</sup>

The studies conducted on fetal outcomes of MSAF during labour are limited in Pakistan. This study was therefore planned to determine the frequency of adverse fetal outcomes in labour with meconium stained amniotic

fluid. The results of this study will help in introducing strategies to decrease the incidence of these highly prevalent adverse outcomes in our population.

## Methodology

This study was conducted at Department of Gynaecology and Obstetrics, Qazi Hussain Ahmad Medical Complex Nowshera, Pakistan Sept 2022 to March 2023.

A total of 115 pregnant women with a term (>37 weeks gestation), singleton, uncomplicated pregnancy with cephalic presentation going through labour induction and had MSAF on rupture of membrane were enrolled in the study through consecutive sampling. 115 sample size, using expected prevalence of Apgar<7 by 12.2%, margin of error 6% and 95% confidence level was calculated by WHO sample size software.<sup>16</sup>

All women with >37 weeks gestation, live singleton pregnancy, cephalic presentation with spontaneous onset of labor where meconium in amniotic fluid was observed during spontaneous rupture or artificial rupture of membranes were included in the study.

Pregnancies in which women were unaware of their last menstrual date, pregnancies with gestation weeks less than 37 or greater than 42, cases of antepartum hemorrhage, fetal malformations, malpresentations, intrauterine growth restriction (IUGR), intrauterine fetal death, maternal heart, lung, or renal diseases, as well as pregnancies complicated by medical conditions such as diabetes or preeclampsia, were excluded from the study.

Data related to demographics like age, gestational age and parity were recorded on the given format. Detailed history of the patients was taken and general and systemic status was recorded. Follow up of the progress of labor with the use of partogram was done to observe that labour is progressing normally. Artificial rupture of membrane was performed where labour progression didn't match the partogram. Presence of meconium staining was noted and recorded with its details of being thin (yellow or greenish color), moderate (darkly stained) or thick (dark green or black). Neonatologist and obstetrician made detailed examination of the neonate. Daily follow up was done and a final follow up visit in OPD was made after 2 week time.

Primary outcome were set as fetal outcomes in terms of 1 & 5 minutes Apgar score < 7, MAS, fetal distress, birth asphyxia, NICU admission and still birth. Ethical approval of conducting the study was taken from the

ethical committee of the hospital. Consent was taken from the participants on written forms.

Data analysis was performed using SPSS version 25. Standard deviation and mean was also calculated for the analysis. Quantitative variables were expressed in form of mean and standard deviation. Qualitative variables were expressed in form of frequency and percentage. Descriptive analysis was done by applying frequency and percentage.

## Results

The mean age in this study was 29.6±5.35 years with an age range of 19-40 years while the Mean±SD of gestation was 39.73±1.27 weeks. Details of demographics and clinical findings are shown in table I.

**Table I: Demographics and clinical findings. (n =115)**

<b>Demographics and Clinical Findings</b>	
Age (years) Mean±SD	29.6±5.35
<b>Gestational Status</b>	
Gestational Age (Weeks) Mean±SD	39.73±1.27
Gestational Age in week	n (%)
38-40 week	79 (68.69)
41-41 week	36 (31.30)
<b>Parity</b>	
Primiparity	57 (49.56)
Multiparity	58 (50.43)
<b>Degree of Meconium</b>	
Thin	53 (46.08)
Moderate	46 (40)
Thick	16 (13.91)

Adverse fetal outcomes were recorded for these labours with MSAF including Apgar score at 1 and 5 minutes, MAS, fetal distress, birth asphyxia, admission in NICU and still birth. Details of these fetal outcomes reported in this study are shown in Table II.

**Table II: Frequency and percentage of fetal outcomes. (n=115)**

<b>Adverse fetal outcomes</b>	
Apgar Score at 1 min (Mean±SD)	6.52±1.40
Apgar Score at 5 min (Mean±SD)	6.96±0.95
Apgar	n (%)
Apgar< 7 at 1 min	29 (25.21)
Apgar< 7 at 5 min	12 (10.43)
MAS	12 (10.43)
Fetal Distress	28 (24.34)
Birth Asphyxia	15 (13.04)
Admission in NICU	28 (24.34)
Still Birth	3 (2.60)

Adverse fetal outcomes were also recorded as per degree of meconium for these labours with MSAF which shows that most of the adverse outcomes were observed in patients with thick MSAF as shown in Table III.

**Table III: Frequency and percentage of adverse fetal outcomes in patients as per degree of MSAF. (n=115)**

<b>Adverse fetal outcomes</b>	<b>Degree of MSAF</b>		
	<b>Thick (n=16)</b>	<b>Moderate (n=53)</b>	<b>Thin (n=46)</b>
Apgar Score at 1 min (Mean±SD)	5.46±1.66	5.95±1.39	7.28±0.86
Apgar Score at 5 min (Mean±SD)	5.61±1.75	6.93±0.48	7.32±0.67
<b>Frequency (Percentage)</b>			
Apgar< 7 at 1 min	8 (50)	19 (35.84)	2 (4.34)
Apgar< 7 at 5 min	8 (50)	3 (5.66)	1 (2.17)
MAS n	8 (50)	3 (5.66)	1 (2.17)
Fetal Distress	13 (81.25)	15 (28.30)	0 (0)
Birth Asphyxia	12 (75)	3 (5.66)	0 (0)
Admission in NICU	13 (81.25)	15 (28.30)	0 (0)
Still Birth	3 (18.75)	0 (0)	0 (0)

## Discussion

Different researchers in national and international medical literature have discussed MSAF and related fetal outcomes in different studies. Mundhra and Agarwal conducted a study with prospective observational design to determine the fetal outcome in MSAF. Neonatal outcome was poor in terms of low Apgar score at birth at 1 minute (20%), <7Apgar score at 5 minute (9.69%), MAS (3.03%), birth asphyxia (15.15%), Admission in NICU (21.21) and neonatal death (3.03%) in cases of MSAF.<sup>14</sup>

Vaghela, Deliwala and Shah published the results of their prospective study for evaluating the fetal outcomes in woman having deliveries at >37 weeks gestational age and with meconium stained liquor. Apgar score of <7 at 1 min was observed in 13% of the patients while Apgar score of <7 at 5 min was observed in 5% of the cases. It was important that the low Apgar score was observed more in patients with thick meconium liquor (17.85% and 7.14% respectively at 1 and 5 minutes respectively). The overall incidence of fetal distress was 25% however this ratio was significantly high in patients with thick meconium liquor (52%). The overall rate of NICU admissions was 30% while this rate was as high as 46.42% in cases of thick meconium liquor. The reported perinatal mortality in this study was 5%. The researcher therefore concluded that MSAF was related

with increased MAS, birth asphyxia, NICU admissions and perinatal mortality.<sup>17</sup>

Dohbit et al. shared the results of their prospective cohort study for determining the maternal and fetal outcomes in labours with term singleton pregnancies and having MSAF. They also studied the maternal and fetal adverse outcomes in relation to thick or light meconium staining. The study results prove that fetal outcomes were poor in cases of thick MSAF. The complications reported were low Apgar score at 5 min., birth asphyxia and need for resuscitation. MAS was reported in 2.34% of the cases. Fetal mortality was reported in 2.38% of the cases and all these deaths were reported in cases with thick meconium staining.<sup>16</sup>

Moeed A et al. conducted a case series study focused on frequency and outcomes of MAS in babies who were born with MSAF. The study reported an incidence of MAS in 14.9% of the patients while no mortality was reported out of 87 babies born with MSAF.<sup>9</sup>

Kapote, Mohite and Syed conducted an analysis between MSAF and clear liquor for their maternal and fetal outcomes. This analysis reported that an Apgar score of <7 after 5 minutes of birth was observed in 5% cases of thick MSAF. Birth asphyxia was reported in 18.18% of the cases while 18% cases required NICU care. Overall neonatal morbidity was reported in 52% of the thick meconium cases while 20% in the thin meconium cases.<sup>18</sup>

A recent study published by Begum A et al. conducted in Pakistani population compared the frequency of fetal outcomes as per the grades of meconium stained liquor. The overall incidence of poor Apgar score was observed in 24.7% of the patients, rate of NICU admissions was 28% while the incidence of still birth was 2%. This was also mentioned that adverse fetal outcomes were significantly associated with thick and moderate meconium staining.<sup>19</sup>

The mean age in our study was 29.6±5.35 years with an age range of 19-40 years. The Mean±SD of gestation was 39.73±1.27 weeks while 68.69% of the patients were between 38-40th week of gestation. Multiparity was present in 50.43% of the cases while 49.56% were with Primiparity. Assessment of degree of meconium staining showed thin staining in 53 (46.08) cases, moderate staining in 46 (40) and thick staining in 16 (13.91%) cases. The results of our study are also in line with the results of studies mentioned above. Apgar< 7 at 1 min was observed in 29 (25.21%) patients, Apgar< 7 at 5 min was observed in 12 (10.43%) patients as

observed in studies conducted previously.<sup>14,19</sup> MAS was observed in 12 (10.43%) of the patients. Other adverse fetal outcomes included fetal distress 28 (24.34%), asphyxia 15 (13.04%), NICU admission 28 (24.34%) and still birth 3 (2.6%). These results are also in line with the results proven in studies conducted previously in this segment of patients.<sup>14,16,17,18,19</sup>

Another important findings was that high ratio of adverse fetal outcomes was found in patients with thick MSAF. In cases of thick meconium staining, Apgar< 7 at 1 minute was observed in 50% and Apgar< 7 at 5 minutes also in 50% of cases. Other adverse outcomes in thick meconium stained cases were MAS (50%), fetal distress (81.25%), birth asphyxia (75%), admission in NICU (81.25%) and still birth (18.75%) cases of thick meconium staining of amniotic fluid. This correlation was also reported previously by the studies discussed above.<sup>17,18,20,21</sup>

Limitations of this study include its small sample size. Moreover, the study was conducted in a hospital where good quality facilities for the maternal and fetal health was available while a lot of deliveries are conducted in small set ups where the adverse outcomes may higher than observed in this study. More studies in our population with larger number of patients and involving small health care set ups may be helpful to find more details regarding fetal outcomes in MSAF.

## Conclusion

The incidence of adverse fetal outcomes is high in our country compared to the developed world. Meconium staining of amniotic fluid is a commonly observed incidence and is associated with the adverse fetal outcomes. It is therefore important to diagnose the incidence and degree of meconium staining and improve the NICU facilities in health care set ups. This will thereby help to decrease the incidence of fetal morbidity and mortality in our population.

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