



## Obstetrics &amp; Gynaecology

## A STUDY TO EVALUATE MATERNAL AND FETAL OUTCOME IN TERM PREGNANCY WITH MECONIUM STAINED AMNIOTIC FLUID: A PROSPECTIVE OBSERVATIONAL STUDY AT A TERTIARY CARE CENTRE IN INDIA

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**ABSTRACT**

**Background:** Globally, 7-22% of all live births are complicated by meconium stained amniotic fluid (MSAF). MSAF is considered a predictor of adverse fetal outcome, and meconium aspiration syndrome, a major cause of perinatal morbidity and mortality. This study aimed to find out the incidence of MSAF and to find a clinical correlation of neonatal outcome with amnioinfusion and mode of delivery among the study groups.

**Methods:** A prospective observational study was conducted at Sassoon General Hospital, Pune, India from October 2017 to March 2019. 206 patients who fulfilled the inclusion criteria were studied. Subgroups of with/without amnioinfusion were analyzed in terms of mode of delivery and neonatal outcome.

**Results:** The incidence of MSAF in term pregnancies was found to be 9.13 %. Patients were divided into 2 study groups: thick MSAF and thin MSAF. 76.2% of patients were managed with amnioinfusion. A significant reduction in the number of cesarean sections observed among patients with thick MSAF. A significant improvement in APGAR score was observed in newborns with amnioinfusion for thick MSAF. There was a decrease in neonatal intensive care unit stay, neonatal morbidity and mortality.

**Conclusion:** Taking the risks of MSAF into consideration, a trial of labour should be given where continuous electronic fetal monitoring and emergency cesarean section facilities are available. Amnioinfusion decreased the rate of emergency cesarean section and improved the APGAR score in patients with thick MSAF.

**KEYWORDS :** Meconium Stained Amniotic Fluid, Amnioinfusion, NICU Admissions, Meconium Stained Liquor

**INTRODUCTION**

Meconium is defined as the first faecal excretion of a newborn child, composed chiefly of bile, mucus, and epithelial cells.

Fetal defecation of meconium during labour causes staining of the amniotic fluid or the infant is called Meconium staining. Although the exact cause is not known, meconium is thought to be passed from the fetal gastrointestinal tract as a response to hypoxia, mesenteric vasoconstriction induced gut hyper peristalsis, falling umbilical venous saturation, vagal stimulation and normal physiological function of a mature fetus. Meconium staining of amniotic fluid (MSAF) has for long been considered to be a predictor of adverse fetal outcome, and meconium aspiration syndrome (MAS), a major cause of perinatal morbidity and mortality.

Meconium stained amniotic fluid (MSAF) is present in 1- 18% of all deliveries [1]. Meconium aspiration syndrome (MAS) occurs in 1-3% of all cases of MSAF and in 10-30 % of neonates meconium is present below the vocal cords [2]. Infants born through MSAF are 100 times more likely to develop respiratory distress compared to their counterparts born through clear amniotic fluid [3]. Meconium continues to be considered a soft marker of fetal distress. Soft markers such as MSAF can be important in influencing obstetrical decisions and most obstetricians would confirm that the same situation is viewed differently in the presence of MSAF. Conflicting outcomes have been reported in the labours, complicated by meconium staining of the amniotic fluid, varying with the degree of meconium staining.

Fetal distress is defined as alterations in the fetal heart rate (FHR) more commonly bradycardia and the passage of meconium in response to the underlying fetal hypoxia. While the passing of meconium may not always pose a threat to fetal outcomes, it is definitely an indicator of heightened vigilance. The currently available research papers do not provide simple and clear guidelines for students to differentiate between normal risk, moderate risk and high-risk pregnancies in the presence of Meconium staining of amniotic fluid.

This study aims to provide an up to date assessment of the true significance of MSAF and the meaning of its presence for the managing obstetrician, immediate postpartum fetal well-being and identification of probable risk factors for the development of MSAF.

The study will prove beneficial for obstetricians in better decision making for choosing the mode of delivery and help neonatologists in making better interventions. In the past two decades, attention has been focused on the need for strengthening newborn care at the primary care level. In a developing country like ours, where over 60% of births are domiciliary, the role of anticipation and timely referral assumes great importance. The outcomes of this study can help in generating better guidelines to enhance training at primary health centres.

**MATERIALS & METHODS**

This observational prospective study was conducted at Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospital, Pune, India in the department of Obstetrics and Gynecology from October 2017 to March 2019. The study was commenced after the approval of the Institutional Ethics Committee. A total of 2256 patients who delivered during the study period were considered for calculating the incidence of MSAF in term pregnancies. Out of them, 206 patients fulfilled the inclusion criteria. All patients with meconium-stained liquor after spontaneous or artificial rupture of membranes during labour, a singleton pregnancy, cephalic presentation and full-term gestation (gestational age >37 weeks) were included in the study. All pregnant women who did not give consent to participate in the study or had other obstetric/fetal risk factors like prematurity, previous cesarean section, multiple pregnancies, non-cephalic presentations, fetal anomalies, obstetric complications like preeclampsia were excluded from the study.

**METHODOLOGY**

We studied 2256 cases who delivered during the study period. Cases showing meconium-stained liquor after spontaneous or artificial rupture of membranes during labour were part of the study group. They were divided into 2 groups: cases with thin MSAF and cases with thick meconium-stained amniotic fluid. Thick greenish amniotic fluid with the particulate matter was termed as thick MSAF while thin, watery, greenish amniotic fluid without particulate matter was termed as thin MSAF. As a part of management, amnioinfusion was done with normal saline for some of the cases and its benefits were documented. The mode of delivery was documented and the newborn's assessment was done. The study of fetal management in case of complications was also studied and documented. Mother and baby were monitored till the discharge.

**RESULTS**

At our institute, the incidence of MSAF in term pregnancies was found to be 9.13 %. The cases were classified into two groups: patients with thick MSAF and patients with thin MSAF. 43.2% had thick MSAF whereas 56.80 % had thin MSAF. This has been depicted in Table 1.

**Table 1: Calculation Of Incidence**

Number of Women Delivered in the Centre	Number of patients with MSAF	Incidence of MSAF	Number of patients with Thick MSAF	Percent age of Thick MSAF	Number of patients with Thin MSAF	Percent age of Thin MSAF
2256	206	9.13	89	43.20	117	56.80

Maximum patients (40.77%) belonged to 21-25years of age. The minimum age noted was 18 (completed years at the time of registration) and the maximum age was 40 years. The mean age of patients with meconium stained amniotic fluid was 26.35 years. Out of all MSAF cases, every second female was a primigravida. Maximum proportion (35.44%) of patients had a gestational age of 38-38+6weeks.

Table 2 depicts the incidence of MSAF as per patient characteristics. Patients in the age group ( 36-40 years) had the highest incidence ( 36.84 %) among all age groups. Primigravida had the highest incidence (12.65 %) among all the parity groups. Among various gestational age, the highest incidence ( 53.84%) was found for gestational age 41 -41+6.

**Table 2: Incidence Of MSAF As Per The Patient Characteristics**

Patient characteristics	Non MSAF Females (n=2050)	Proportion	MSAF Females (n=206)	Proportion	Incidence of MSAF in the study group	P value
<b>Age (years)</b>						
16-20 years	529	25.8	26	12.62	4.91	0.00001
21-25 years	830	40.48	84	40.77	10.12	0.93624
26-30 years	423	20.63	49	23.78	11.5	0.28914
31-35 years	230	11.21	33	16.01	14.34	0.04036
36-40 years	38	1.85	14	6.79	36.84	0.00001
<b>Parity</b>						
Primigravida	822	40.10	104	50.49	12.65	0.0039
Para 1	892	43.51	72	34.95	8.07	0.0179
Para 2	280	13.66	24	11.65	8.57	0.4207
Para 3 and above	56	2.73	6	2.91	10.71	0.8806
<b>Gestational age (weeks)</b>						
37 - 37 <sup>6</sup>	492	18.92	52	25.4	13.4	0.68916
38 - 38 <sup>6</sup>	410	32.14	42	20.39	6.37	0.89656
39 - 39 <sup>6</sup>	799	38.97	73	35.44	9.13	0.32218
40 - 40 <sup>6</sup>	258	8.43	20	9.71	11.23	0.23014
41 - 41 <sup>6</sup>	65	1.26	14	6.80	53.84	0.00694

Z score was calculated for population proportions among various patient characteristic categories. A statistically significant proportion of patients in age groups: 16- 20 years ( p=0.00001), 31-35 years (p=0.04036) and 36-40 years (p= 0.00001) had meconium stained amniotic fluid. The difference in proportion was highly significant in primigravida (p=0.0039) and significant in para 2 (p=0.0179). A statistically significant proportion of patients with gestational age 41-41+6 ( p=0.00694) had meconium stained amniotic fluid 76.2% of patients with meconium stained liquor were managed with amnioinfusion. The greater proportion of them had thin meconium stained liquor. The major reason for management without amnioinfusion was fetal distress/non-reactive CTG, thus warranting immediate cesarean section.

Table 3 depicts the maternal outcome (mode of delivery) among patients with meconium stained amniotic fluid with/ without amnioinfusion.

Using the chi-square test, it was concluded that with amnioinfusion, there was a significant reduction in the number of LSCS( lower segment caesarean section) required among patients with thick MSAF.

There was no significant reduction in the number of LSCS with amnioinfusion among patients with thin MSAF.

**Table 3: Maternal Outcome (mode Of Delivery) Among Patients With Meconium Stained Amniotic Fluid With/ Without Amnioinfusion**

THICK MECONIUM STAINED AMNIOTIC FLUID			
MODE OF DELIVERY	Amnioinfusion Done (N = 61)	Amnioinfusion not done (N = 28)	P-value
Lower segment caesarean section	16	20	0.0001
Vaginal delivery	40	5	0.0001
Instrumental delivery	5	3	0.69654
THIN MECONIUM STAINED AMNIOTIC FLUID			
MODE OF DELIVERY	Amnioinfusion Done (N = 96)	Amnioinfusion not done (N = 21)	P-value
Lower segment caesarean section	27	7	0.63122
Vaginal delivery	61	11	0.34212
Instrumental delivery	8	3	0.39532

Table 4 shows APGAR Score among patients with thick meconium stained amniotic fluid for various modes of delivery who were managed with and without amnioinfusion.

**Table 4: APGAR Score Among Patients With Thick Meconium Stained Amniotic Fluid For Various Modes Of Delivery, With And Without Amnioinfusion**

APGAR SCORE	APGAR Score in Amnioinfusion Group With Thick MSAF (N=61)					
	Vaginal delivery N=40		Lower segment caesarean section N=16		Instrumental delivery N=5	
	Number	Percent age	Number	Percent age	Number	Percent age
0-3	7	17.5	1	6.25	1	20
4-6	7	17.5	3	18.75	1	20
7-10	26	65	12	75	3	60
APGAR SCORE	APGAR Score in Non-Amnioinfusion Group With Thick MSAF (N=28)					
	Vagina delivery N=20		Lower segment caesarean section N= 5		Instrumental delivery N= 3	
	Number	Percent age	Number	Percent age	Percent age	Number
0-3	5	25	1	20	1	33
4-6	8	40	2	40	1	33
7-10	7	35	2	40	1	33

Table 5 shows APGAR Score among patients with thin meconium stained amniotic fluid for various modes of delivery who were managed with and without amnioinfusion

There was a significant improvement in the APGAR score of the newborns of patients who underwent amnioinfusion for thick MSAF. No significant improvement in the APGAR score of the newborns of patients who underwent amnioinfusion for thin MSAF. Table 6 depicts neonatal outcomes among neonates with the APGAR scores ≤ 3 in the amnioinfusion and non amnioinfusion groups

In the amnioinfusion group, 14.7% of thick MSAF cases had APGAR scores ≤ 3 and were admitted to NICU with an average stay of 10 days.1 case of thick MSAF managed with amnioinfusion did not survive and died due to birth asphyxia. Only 7.29% of thin cases had APGAR scores ≤ 3 and were admitted to NICU. One case of thin MSAF managed with amnioinfusion died due to late onset sepsis.

In the non- amnioinfusion group, 25% of thick MSAF cases had APGAR scores ≤ 3 and were admitted to NICU with an average stay of 12 days.Two cases of thick MSAF managed with amnioinfusion died due to birth asphyxia and septicaemia respectively. Only 9.52% of thin MSAF cases had APGAR scores ≤ 3 and were admitted to NICU with an average stay of 8 days. There were no deaths.

**Table 5: APGAR Score Among Patients With Thin Meconium Stained Amniotic Fluid For Various Modes Of Delivery, With And Without Amnioinfusion**

APGAR Score in Amnioinfusion Group With Thin MSAF (N=96)						
APGAR SCORE	Vaginal delivery N=61		Lower segment caesarean section N=27		Instrumental delivery N=8	
	Number	Percent age	Number	Percent age	Number	Percent age
0-3	5	8.19	1	3.70	1	12.50
4-6	11	18.03	5	18.52	3	37.50
7-10	45	73.77	21	77.78	4	50.00
APGAR Score in Non-Amnioinfusion Group With Thin MSAF (N=21)						
APGAR SCORE	Vaginal delivery N=7		Lower segment caesarean section N=11		Instrumental delivery N=3	
	Number	Percent age	Number	Percent age	Number	Percent age
0-3	1	14.28	1	9.09	0	0
4-6	2	28.57	2	18.18	2	66.67
7-10	4	57.14	8	72.73	1	33.33

**Table 6: Neonatal Outcome Among Neonates With APGAR Scores ≤3 In The Amnioinfusion Group**

AMNIOINFUSION GROUP									
MS AF TYPE	APGAR SCORE (0-3)		AVERAGE NICU STAY (Days)	RECOVERED WITHOUT SEQUELAE		RECOVERED WITH SEQUELAE		DIED	
	Number	%		Number	%	Number	%	Number	%
Thick (61)	9	14.7	10	5	55.56	3	33.33	1	11.11
Thin (96)	7	7.29	8	4	57.14	2	28.5	1	14.29
NON AMNIOINFUSION GROUP									
MS AF TYPE	APGAR SCORE (0-3)		AVERAGE NICU STAY (Days)	RECOVERED WITHOUT SEQUELAE		RECOVERED WITH SEQUELAE		DIED	
	Number	%		Number	%	Number	%	Number	%
Thick (28)	7	25	12 days	3	42.85	2	28.57	2	28.57
Thin (21)	2	9.52	8 days	1	50.00	1	50.00	0	0

## DISCUSSION

Passage of meconium may simply represent the normal gastrointestinal maturation or it may indicate an acute or chronic hypoxic event, thereby making it a warning sign of a fetal compromise. It's associated with an increased incidence of cesarean section and neonatal morbidity and mortality. Taking the risks of MSAF into consideration, this study was done in our hospital, where facilities of continuous electronic fetal monitoring and emergency cesarean section were available; with an aim to compare the fetal and maternal outcome in deliveries complicated by meconium staining and to study the use of amnioinfusion.

We studied 2256 cases who delivered during the study period. Cases showing meconium stained liquor after spontaneous or artificial rupture of membranes during labour were part of the actual study group. After fulfilling the inclusion and exclusion criteria, 206 patients were selected to be a part of this study. Two groups were formed among them based on the consistency of the amnioinfusion. Group 1 included patients with thin meconium stained amniotic fluid and group 2 included patients with thick meconium stained amniotic fluid.

The incidence of MSAF found at our institute was 9.13%. The incidence among various studies such as Narag et al (7.4%), Veenita Gupta et al (14.3%), Davis et al (15 %) ranged from 3% to 15% [4-6]. In our study, the incidence of meconium stained amniotic fluid was 9.13% which is slightly higher than the mean incidence of all studies.

This could be attributed to our institute, being a tertiary care teaching hospital, is a major referral centre in the city.

Meconium passage occurred in 8-17% of all deliveries, out of which approximately 54% were complicated by thick and 46% by thin meconium [4,5,7]. In our study, thick meconium was present in 43.20% and thin meconium in 56.80%.

Among various gestational ages, the highest incidence (53.84%) was found for gestational age 41 - 41+6 weeks. This was comparable to Narang et al [4]. The Meconium passage was uncommon before 38 weeks and increased after 40 weeks (Katz and Bowes) [8]. However, more research needs to be done to postulate if meconium stained amniotic fluid is due to hypoxia or gut maturity. Gestational age was found to be a significant factor with respect to meconium stained amniotic fluid in the studies conducted by Becker et al, Mundra et al, Naveen et al, Greenwood et al and Mies et al [9-13]. In the present study, only 9.23% of the patients with meconium stained amniotic fluid had pregnancies beyond 41 weeks gestation. However, when it was compared with patients in non meconium stained liquor, this was found to be significant.

Pushpa et al [14] stated that 'Forceps was applied in 3.35% cases of MSAF. Incidence of lower segment cesarean section (LSCS) was 43.02% and vaginal deliveries were 53.36% in MSAF'. In our study, more than half (56.79%) cases of MSAF were delivered vaginally. 33.9% were delivered by LSCS and only 9.22% were delivered by instrumental delivery.

With amnioinfusion, there was a significant reduction in the number of LSCS required among patients with thick MSAF. There was a proportional rise in the number of vaginal delivery. Among patients with thin MSAF, the incidence of vaginal/instrumental delivery was more compared to LSCS. However, there was no statistically significant reduction found in the number of LSCS with amnioinfusion. This signifies that amnioinfusion is beneficial in protecting the fetus by providing increased fluid volume in the uterine cavity, especially in patients with thick MSAF

In our study, we found that APGAR Score ≤3 was found for 10.2% of infants in the amnioinfusion group and 18.3% infants in the non-amnioinfusion group. There was a significant improvement in the APGAR score of the newborns of patients who underwent amnioinfusion for thick meconium stained amniotic fluid. No significant improvement in the APGAR score of the newborns of patients who underwent amnioinfusion for thin MSAF. The average NICU stay ranged from 8-12 days in the study population. Among infants with APGAR score i.e. ≤3, 48% of infants recovered without any sequelae, 36% recovered with sequelae and 16% died. The neonatal mortality rate in the study group was 1.94%, of which 3.37% of neonates belonged to the thick MSAF group and 0.85% of neonates belonged to the thin MSAF group. The major cause of death was birth asphyxia and septicemia.

## CONCLUSIONS

Amnioinfusion was found to be useful to decrease the rate of emergency cesarean section among patients with thick MSAF. There was a significant improvement in the APGAR score of the newborns of patients who underwent amnioinfusion for thick MSAF. There was a decrease in NICU stay, neonatal morbidity and mortality.

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