



Original Research Article

Prevalence of meconium stained amniotic fluid and meconium aspiration syndrome according to gestational age and parity of mother

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ABSTRACT

Introduction: The first demonstrable meconium is found around the third month of the gestational age in the intestines of the fetus as black green color, odorless mass. Multiple conditions of intrauterine fetal distress is said to be causative reason for intrauterine passage of meconium in the amniotic fluid by the fetus. Aspiration of meconium stained amniotic fluid may lead to a gasping breathing pattern which induces hypoxia via airway obstruction, surfactant dysfunction, chemical pneumonitis, and pulmonary hypertension.

Aims and Objectives: The aim of the present study was to find the prevalence of various grades of meconium stained amniotic fluid as well as meconium aspiration syndrome according to gestational age and parity.

Results: The present study was a prospective observational study. It was conducted in the Obstetrics and Gynecology department of Tertiary Hospital & Medical Collage & Research Centre, Ahmedabad, Gujarat, India during May 2016 to May 2018 on 200 laboring mothers with meconium stained amniotic fluid who delivered or underwent cesarean section in the institute were included in the study. MSAF grade 1 cases were maximum 40/82(48.78%) in mothers having previous vaginal delivery. MSAF grade 2 cases were maximum 51/63(80.95%) in primigravid mothers. MSAF grade 3 cases were maximum 24/55(43.64%) in primigravid mothers. 3.96% of the primigravida patients were found to have MAS whereas 15.38% of the patients with previous vaginal delivery were having MAS. Maximum cases of grade 1 MSAF 64/82(78.05%), grade 2 MSAF 40/63(63.49%) as well as grade 3 MSAF 26/55(47.27%) were in mothers having gestational age between 37-40 weeks at the time of delivery of baby. 45.45% patients having gestational age less than 37 weeks, 4.62% of the patients having gestational age between 37-40 weeks, and 6.78% patients having gestational age greater than 40 weeks were having MAS.

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1. Introduction

Meconium is an odorless black-green color material found in the fetal intestine. It is first demonstrable in the fetal intestine at the third month of gestational age.¹ Meconium is formed by the accumulation of water, intestinal epithelial cells, lanugo, mucous, bile etc.² Majority of healthy full term babies pass meconium within 48 hours of being born. Factors those promote passage of meconium in

the amniotic fluid in utero include placental insufficiency, maternal hypertension, oligohydramnios, preeclampsia, infection, maternal drug abuse, acidosis or any other reasons which can cause intrauterine distress.^{3,4} Umbilical cord compression as well as vascular anomalies of umbilical cord may also lead to passage of meconium into the amniotic fluid.⁵ As gestational age of fetus approaches towards the full term, the gastrointestinal tract matures and vagal stimulation or spinal cord compression may cause peristalsis and relaxation of the rectal sphincter leading to meconium passage into amniotic fluid.⁶ Meconium alters the chemical

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characteristics of amniotic fluid which reduces antibacterial activity and increasing the risk of perinatal bacterial infection. Aspiration of meconium stained amniotic fluid may lead to a gasping breathing pattern which induces hypoxia via airway obstruction, surfactant dysfunction, chemical pneumonitis, and pulmonary hypertension.⁷ In addition intrauterine exposure of fetal respiratory tract to meconium is associated with inflammation of lung tissues.⁸ Meconium deactivates the surfactants and also inhibits the synthesis of surfactants.^{9,10} Free fatty acids present in the meconium strip the surfactants from the alveolar surface causing diffuse atelectasis.¹¹ Passage of meconium into the amniotic fluid and aspiration of meconium stained amniotic fluid into fetal respiratory tract is multifactorial process affected by so many antenatal, intrapartum as well as neonatal factors.

The aim of the present study was to find the prevalence of various grades of meconium stained amniotic fluid as well as meconium aspiration syndrome according to gestational age and parity.

2. Materials and Methods

The present study was a prospective observational study. It was conducted in the Obstetrics and Gynecology department of Tertiary Hospital & Medical Collage & Research Centre, Ahmedabad, Gujarat, India during May 2016 to May 2018. A total of 200 laboring mothers with meconium stained amniotic fluid who delivered or underwent cesarean section in the institute were included in the study.

All the laboring mothers with Meconium Stained Liquor (MSL) who gave permission to participate in the study with singleton pregnancies were included in the study. The patients who didn't give consent, mothers who presented with intrauterine fetal death, mothers who had non-cephalic presentation and with multi fetal gestation were excluded.

A structured pretested proforma was used to collect data. The Ethical Review Board approval was taken before starting the study. The study participants were informed about the objectives and benefits of the study following which informed consent was obtained in all three languages viz. English, Gujarati and Hindi. All of the information accessed during the study was used for the purpose of this study alone. Relevant data were abstracted from the neonatal chart and the logbook in the neonatology ward.

The collected data was analyzed using SPSS version 20 (IBM Corporation). Descriptive statistical measures such as frequencies and percentages were generated and presented in tables. For finding associations between different variables, we used two chi-square test. To find the degree of association, Cramer's V was used.

Apgar score was determined by evaluating the newborn baby on five simple criteria on a scale from zero to ten, then repeating it at five minutes. Meconium stained liquor was

categorized in to three categories. Grade I MSL included small amount of meconium diluted in a plentiful amount of amniotic fluid. This gives the fluid only a slightly greenish or yellowish discoloration. Grade II MSL included the cases having moderate meconium staining, when there is a fair amount of amniotic fluid, but it is clearly stained with meconium. In this case it will be 'khaki green' or brownish in color. Grade III MSL were the cases with heavy staining, when there is reduced amniotic fluid and large amount of meconium, making the staining quite thick, with 'pea soup' consistency.

3. Observations

A total of 200 laboring mothers participated in the present study. As shown in the Table 1, majority of them were between 20 – 30 years of age (59%). The women between 31 – 35 years of age were 27%. Participants either <20 years or >35 years were 9% and 5% respectively.

Table 1: Age distribution of patients

S. No	Groups	Number of patients	Percentage %
1	<20 Yrs.	18	9
2	20-30 Yrs.	118	59
3	31-35 Yrs.	54	27
4	>35 Yrs.	10	5
	Total	200	100

Table 2: Parity in patients

S. No	Parity	Number of patients	Percentage %
1	Primigravida	101	50.5%
2	Previous VD	52	26%
3	Previous CS	47	23.5%
	Total	200	100

As shown in Table 2 , out of total 200 selected patients, 101(50.5%) were primigravida, 52(26%) were having previous vaginal delivery, 47(23.5%) were having previous cesarean section delivery. Maximum patients 101(50.5%) were pregnant for the first time (primigravida), while 99(49.5%) were multigravida either having previous vaginal delivery or cesarean section delivery.

Table 3: Gestational age at the time of delivery

S. No.	Gestational Age	Number of patients	Percentage %
1	<37 Weeks	11	5.5%
2	37-40 weeks	130	65%
3	>40 Weeks	59	29.5%
	Total	200	100

Table 3 showing the gestational age of mother at the time of delivery. Out of total 200 laboring mothers, 11(5.5%)

mothers delivered baby at gestational age less than 37 weeks, 130(65%) mothers delivered baby at gestational age between 37-40 weeks while 59(29.5%) mothers delivered baby at gestational age more than 40 weeks. Maximum patients 130(65%) were having gestational age between 37-40 weeks at the time of delivery of baby.

Table 4: Patient distribution based on MSAF grade

S. No	MSAF Grade	Number of patients	Percentage %
1	1	82	41%
2	2	63	31.5%
3	3	55	27.5%
	Total	200	100

As shown in Table 4, out of total 200 laboring mothers having fetuses with various grades of meconium stained amniotic fluid (MSAF), 82(41%) were having MSAF grade 1, 63(31.5%) were having MSAF grade 2, 55(27.5%) were having MSAF grade 3. Maximum patients 82(41%) were having MSAF grade 1.

As shown in Table 5, MSAF grade 1 cases were maximum 40/82(48.78%) in mothers having previous vaginal delivery, while minimal 16/82(19.51%) in mothers having previous cesarean section delivery. MSAF grade 2 cases were maximum 51/63(80.95%) in primigravida mothers, while minimal 2/63(3.17%) in mothers having previous vaginal delivery. MSAF grade 3 cases were maximum 24/55(43.64%) in primigravida mothers, while minimal 10/55(18.18%) in mothers having previous vaginal delivery. Out of 101 primigravida patients 51(50.50%) were having MSAF grade 2, while 24(23.76%) were having MSAF grade 3. Out of 52 patients having previous vaginal delivery 40(76.92%) were having MSAF grade 1, while 2(3.85%) were having MSAF grade 2. Out of 47 patients having previous cesarean section delivery 21(44.68%) were having MSAF grade 3, while 10(21.28%) were having MSAF grade 2.

As shown in Table 6, out of 101 primigravida patients in the study, 4(3.96%) were found to have MAS; out of 52 patients with previous vaginal delivery, 8(15.38%) were having MAS while out of 47 patients with previous cesarean section delivery, 3(6.38%) were having MAS. Total 15 patients out of 200(7.5%) were reported to have MAS. Out of 15 total cases of MAS, 4(26.67%) were in primigravida patients, 8(53.33%) were in patients having previous vaginal delivery and 3(20%) were in patients having previous cesarean section delivery.

As shown in Table 7, maximum cases of grade 1 MSAF 64/82(78.05%), grade 2 MSAF 40/63(63.49%) as well as grade 3 MSAF 26/55(47.27%) were in mothers having gestational age between 37-40 weeks at the time of delivery of baby. while minimal cases of grade 1 MSAF 0/82 (0%), grade 2 MSAF 6/63 (9.52%) as well as grade 3 MSAF 5/55 (9.09%) were in mothers having gestational age less

than 37 weeks at the time of delivery of baby. Out of 11 patients having gestational age less than 37 weeks, none were having grade 1 MSAF, while 6 (54.54%) were having grade 2 MSAF. Out of 130 patients having gestational age between 37-40 weeks, 64(49.23%) were having grade 1 MSAF, while 26(20%) were having grade 3 MSAF. Out of 59 patients having gestational age greater than 40 weeks, 24(40.68%) were having grade 3 MSAF, while 17(28.81%) were having MSAF grade 2.

As shown in Table 8, out of 11 patients having gestational age less than 37 weeks, 5(45.45%) were found to have MAS; out of 130 patients having gestational age between 37-40 weeks, 6(4.62%) were having MAS while out of 59 patients having gestational age greater than 40 weeks, 4(6.78%) were having MAS. Total 15 patients out of 200(7.5%) were reported to have MAS. Out of 15 total cases of MAS, 5(33.33%) were having gestational age less than 37 weeks, 6(40%) were having gestational age between 37-40 weeks and 4(26.67%) were having gestational age greater than 40 weeks.

4. Discussion

Neonate passes about 60 to 200 gm of meconium at birth.¹² MSAF is found in about 8-20% of newborn and out of which 2-9% suffers from MAS.¹³ The passage of meconium into the amniotic fluid may be a normal physiological event due to maturity of fetus or may be due to umbilical cord compression or fetal hypoxia.¹⁴

Paudel P et al¹⁵ studied incidence, associated risk factors and outcome evidence of meconium aspiration syndrome in Nepal. They found meconium aspiration syndrome in 122(0.20%) patients out of total 60062 patients studied. In their study, 11/122(9%) cases of MAS were among multiparous women, 78/122(63.9%) cases of MAS were among nulliparous women and 33/122(27%) cases of MAS were among primiparous women. In their study, 13/122(10.7%) cases of MAS were among the women having gestational age less than 37 weeks, 99/122(81.1%) cases of MAS were among the women having gestational age between 37-42 weeks and 10/122(8.2%) cases of MAS were among the women having gestational age greater than 42 weeks. Osava RH et al¹⁶ studied meconium stained amniotic fluid and maternal and neonatal factors associated with it. In their study, 175 out of 1222(14.3%) primigravida patients were having meconium stained amniotic fluid (MSAF), while 113 out of 1178(9.6%) multigravida patients were having MSAF. In their study, out of 98 women having gestational age less than 37 weeks, 4(4.2%) were having MSAF, out of 2020 women having gestational age between 37-41 weeks, 224(11.2%) were having MSAF, while out of 291 women having gestational age greater than 41 weeks, 60(20.6%) were having MSAF. Addisu D et al¹⁷ studied prevalence of meconium stained amniotic fluid and its associated factors among women who gave

Table 5: Association of parity and various grades of MSAF

S. No	Parity	MSAF Grade 1	MSAF grade 2	MSAF grade 3	Total
1	Primigravida	26/101 (25.74%)	51/101 (50.50%)	24/101 (23.76%)	101
		26/82 (31.71%)	51/63 (80.95%)	24/55 (43.64%)	
		40/52 (76.92%)	2/52 (3.85%)	10/52 (19.23%)	
2	Previous VD	40/82 (48.78%)	2/63 (3.17%)	10/55 (18.18%)	52
		16/47 (34.04%)	10/47 (21.28%)	21/47 (44.68%)	
		16/82 (19.51%)	10/63 (15.87%)	21/55 (38.18%)	
Total		82	63	55	200

Table 6: Association of parity and MAS

S. No.	Parity	Number of patients having MAS
1	Primigravida	4/101 (3.96%)
		4/15 (26.67%)
2	Previous VD	8/52 (15.38%)
		8/15 (53.33%)
3	Previous CS	3/47 (6.38%)
		3/15(20%)
Total		15/200 (7.5%)

Table 7: Association of gestational age and various grades of MSAF

S. No.	Gestational Age	Grade 1 of MSAF	Grade 2 of MSAF	Grade 3 of MSAF	Total
1	<37 weeks	0/11 (0%)	6/11 (54.54%)	5/11 (45.45%)	11/200
		0/82 (0%)	6/63 (9.52%)	5/55 (9.09%)	(5.5%)
		64/130 (49.23%)	40/130 (30.77%)	26/130 (20%)	130/200
2	37-40 weeks	64/82 (78.05%)	40/63 (63.49%)	26/55 (47.27%)	(65%)
		18/59 (30.51%)	17/59 (28.81%)	24/59 (40.68%)	59/200
		18/82 (21.95%)	17/63 (26.98%)	24/55 (43.63%)	(29.5%)
Total		82/200 (41%)	63/200 (31.5%)	55/200 (27.5%)	200

Table 8: Association of gestational age and MAS

S. No.	Gestational Age	Number of patients having MAS
1	<37 weeks	5/11 (45.45%)
		5/15 (33.33%)
2	37-40 weeks	6/130 (4.62%)
		6/15 (40%)
3	>40 weeks	4/59 (6.78%)
		4/15(26.67%)
Total		15/200 (7.5%)

birth at term in Felege Hiwot comprehensive specialized hospital, North West Ethiopia. According to their study, the prevalence of meconium stained amniotic fluid was 17.8%. Out of 426 women having gestational age 37-40 weeks, 71(16.7%) were having MSAF, while out of 69 women having gestational age 41 weeks, 17(24.6%) were having MSAF. In the present study, we found meconium aspiration syndrome in 15(7.5%) patients out of total 200 patients of MSAF studied. In the present study, 11/15(73.33%) cases of MAS were among multigravida women and 4/15(26.67%) cases of MAS were among primigravida women. In the present study, 5/15(33.33%) cases of MAS were among the women having gestational age less than 37 weeks, 6/15(40%) cases of MAS were among the women having gestational age between 37-40 weeks and 4/15(26.67%) cases of MAS were among the women having gestational age greater than 40 weeks.

Dr Meena PV et al¹⁸ studied meconium stained amniotic fluid and its fetal outcome in 2124 patients in Tamilnadu, India. They found meconium stained amniotic fluid in 250(11.77%) patients out of total 2124 patients studied. Out of these 250 patients having meconium stained amniotic fluid, 86(34.5%) were having grade 1 MSAF, 102(40.8%) were having grade 2 MSAF and 62(24.8%) were having grade 3 MSAF. In present study, out of 200 patients having meconium stained amniotic fluid, we found 82(41%) were having grade 1 MSAF, 63(31.5%) were having grade 2 MSAF and 55(27.5%) were having grade 3 MSAF. 41% of patients were having grade 1 MSAF in the present study as compared to 34.5% in the study done by Dr Meena et al. 31.5% of patients were having grade 2 MSAF in the present study as compared to 40.8% in the study done by Dr Meena et al. 27.5% of patients were having grade 3 MSAF in the present study as compared to 24.8% in the study done by Dr Meena et al. Khillan S et al¹⁹ studied adverse perinatal outcome and mode of delivery in patients with meconium stained amniotic fluid in 4653 patients in Patiala, Punjab, India. They found meconium stained amniotic fluid in 609(13.09%) patients out of total 4653 patients studied. Out of these 609 patients having meconium stained amniotic fluid, 208(34.1%) were having grade 1 MSAF, 249(40.8%) were having grade 2 MSAF and 152(24.9%) were having grade 3 MSAF. Desai DP et al²⁰ studied fetal heart rate patterns in patients with thick meconium staining of amniotic fluid and its association with perinatal outcome in 136 patients in Vadodara, Gujarat, India. They found significant association between the gestational age more than 40 weeks and meconium stained amniotic fluid. In our study, we found maximum number of cases of MSAF (130/200→65%) as well as MAS (6/15→40%) in patients having gestational age between 37-40 weeks.

Rathoria R et al²¹ studied risk factors and perinatal outcome in meconium stained deliveries from a district of Uttar Pradesh, India. In their study, out of 110 cases

of MSAF, 57(51.82%) pregnant female were primigravida, while 53(48.18%) were multigravida. 30(27.27%) cases of MSAF were having gestational age between 41-42 weeks. Niranjana KS et al²² studied maternal risk factors and the perinatal outcome in meconium stained amniotic fluid in central referral hospital, Gangtok, Sikkim, India. In their study, out of 200 cases of MSAF, 110(55%) pregnant female were primigravida, while 90(45%) were multigravida. 140(70%) cases of MSAF were having gestational age between 37-40 weeks. Manivannan V et al²³ studied clinical profile of meconium aspiration syndrome in relation to gestational age and birth weight and their immediate outcome in 6200 laboring mothers in Tiruvannamalai, Tamil Nadu, India. In their study, out of 6200 patients, 947(15.2%) were having meconium stained amniotic fluid and 94(9.92%) were having meconium aspiration syndrome. Majority of cases 46(48.9%) occurred in term babies with mean gestational age of 38-40 weeks followed by 26(27.6%) 40-42 weeks of gestational age. Akhila A et al²⁴ studied neonatal outcome in meconium stained amniotic fluid in Karad, Maharashtra, India. According to their study, the prevalence of meconium stained amniotic fluid was 7.13%. Number of thin as well as thick meconium stained amniotic fluid cases were more in primigravida patients as compared to multigravida. Tayade S²⁵ studied the significance of meconium stained amniotic fluid in rural setup in Sewagram, Wardha, Maharashtra, India. 86/120(71.66%) cases of MSAF were among primigravida women and 34/120(28.33%) cases of MAS were among multigravida women. Kapote DS et al²⁶ studied comparative analysis of maternal and fetal outcome in meconium stained amniotic fluid and clear amniotic fluid in primigravida. According to their study, out of 8965 total number of deliveries, 121(7.71%) cases having meconium stained amniotic fluid. 62.8% of cases of MSAF were having gestational age 39-40 weeks while 37.19% of cases of MSAF were having gestational age 37-38 weeks. 10 out of 121(8.26%) cases of MSAF were having meconium aspiration syndrome. In the present study 15 out of 200(7.5%) cases of MSAF were having meconium aspiration syndrome (MAS).

5. Conclusion

In the present study, grade 1 meconium stained amniotic fluid as well as meconium aspiration syndrome are more frequent in multigravida patients having previous vaginal delivery and having gestational age between 37-40 weeks at the time of delivery. Grade 2 and 3 meconium stained amniotic fluid are more frequent in primigravida patients having gestational age between 37-40 weeks at the time of delivery. Meconium stained amniotic fluid as well as meconium aspiration syndrome is the signs suggestive of fetal distress and worrisome for the better prognosis of patients. Constant monitoring during pregnancy and labor,

early detection as well as timely intervention will reduce the chances of meconium stained amniotic fluid and meconium aspiration syndrome. This will help in reduction of the neonatal morbidity as well as mortality due to respiratory complications of meconium aspiration syndrome.

6. Source of Funding

None.

7. Conflict of Interest

None.

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