Maternal and Neonatal Outcome in Meconium Stained Amniotic Fluid at Term in Labour - A Retrospective Study

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ABSTRACT

BACKGROUND

Meconium stained amniotic fluid (MSAF) occurs in 12 - 15 % of all deliveries and is frequently associated with adverse outcome in pregnancy. The present study was carried out to find out the maternal and fetal outcome in pregnancy complicated by meconium stained liquor in labour.

METHODS

This retrospective study was carried out at a tertiary care centre at Pune. A total of 340 cases who had meconium stained liquor during labour or was detected on amniotomy was analysed.

RESULTS

Out of 340 cases, 252 (74.1 %) had thin and 88 (25.9 %) had thick meconium. MSAF was detected more in early labour (244, 71.8 %), as compared to advanced labour (96, 28.2 %). 212 (84.13 %) patients with thin meconium delivered by vaginal route. 30 (34.09 %) patients with thick meconium delivered by vaginal route. 40 (15.87 %) patients with thin meconium delivered by LSCS and 58 (65.91 %) with thick meconium delivered by LSCS. This difference was statistically significant (< 0.001). Being multiparous was a protective factor both for mother and baby against the presence of MSAF. A majority of neonates, 199 (58.53 %) were asymptomatic at birth both in thin and thick MSAF group. Endotracheal suctioning was done in 101 (29.7 %) neonates in both groups. 40 neonates (11.77 %) were admitted to NICU for severe birth asphyxia. Meconium aspiration syndrome (MAS) was observed in 20 cases (5.88 %), out of which 18 (90 %) had thick meconium and 02 (10 %) had thin meconium. A total of 04 (1.18 %) neonatal deaths occurred due to MAS. They were born to primigravida, had induced onset of labour with detection of thick meconium and delivered vaginally.

CONCLUSIONS

Meconium stained amniotic fluid (MSAF) is associated with increased incidence of caesarean section, lower Apgar score, NICU admissions, development of meconium aspiration syndrome and neonatal death. Obstetrician should be more vigilant while dealing with cases of thick type of MSAF. A timely caesarean section improves the neonatal outcome.

KEYWORDS

Meconium Stained Amniotic Fluid (MSAF), Meconium Aspiration Syndrome (MAS)

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BACKGROUND

Meconium stained amniotic fluid at delivery (MSAF) occurs in 12 - 15 % of all deliveries and more frequently in post term pregnancies.[1] Meconium consists of various products of secretion, such as glycerophospholipids from the lungs, desquamated fetal cells, lanugo, scalp hair and vernix. It also contains undigested debris from swallowed amniotic fluid. The dark greenish colour is caused by pigments especially biliverdin.[2,3] The consistency of meconium is categorized into thick and thin. Thick meconium is particulate and occasionally referred as pea soup. On the other hand, thin meconium is yellow to light green and is watery. Meconium is present in the fetal intestine in the second trimester; however, it is not present in the amniotic fluid at the time of gestation. Passage of meconium in the amniotic fluid occurs in the late third trimester with the maturation of intestinal smooth muscle and the myenteric plexus.[4] In utero passage of meconium in the amniotic fluid may be physiological as the gastrointestinal tract of the fetus matures with neural control. This is the commonest cause of MSAF before onset of labour.[5] The pathological explanation proposes that fetuses pass meconium in response to hypoxia and academia. The hypoxia causes relaxation of anal sphincter and increased production of motilin which promotes peristalsis. The hypoxic episodes may be acute or chronic. The acute episodes typically occur in labour and chronic episodes are associated with conditions giving to placental insufficiencies.[6] Hypertensive disorders of pregnancy, fetal growth restricted (FGR), oligohydramnios, prolonged latent phase of labour, labour induction are some of the predisposing factors of in utero passage of meconium.[7]

Meconium aspiration is presence of meconium below the vocal cords associated with signs and symptoms of birth asphyxia as tachypnoea, intercoastal retraction, grunting and cyanosis. Typically, the umbilical cord, placenta and neonatal skin also get stained to greenish colour. Meconium aspiration can occur during antepartum, intrapartum or in the postpartum period. It causes mechanical blockage of the airways. Acting as a chemical irritant it causes pneumonitis, alveolar collapse and cell necrosis and also predisposes to secondary bacterial infection in early neonatal period. Severe hypoxemia may lead to neonatal death or long-term neurological sequelae in survivors.[8]

MSAF is associated with abnormal intrapartum fetal heart rate patterns, increased caesarean section rate, depressed Apgar score at birth, NICU admission and neonatal death. Studies have shown that MAS cannot be prevented by caesarean section. However, the subsequent complications arising from meconium aspiration can be reduced.[9] The aim of the study is to find out the maternal and neonatal outcome in pregnancy complicated by meconium-stained amniotic fluid in labour.

METHODS

The index study is a retrospective cohort study concluded at a tertiary care centre in Pune. A retrospective analysis of the medical records obtained from labour room, maternity ward, operation room register and discharge section of deliveries complicated with meconium stained amniotic fluid between Jan 2015 to May 2020 were carried out. The ethical clearance was obtained from the institutional ethical committee as per protocol (IEC/2020/54). The inclusion criteria include primigravida / multigravida of gestational age more than 36 weeks with cephalic presentation having singleton pregnancy who reported with labour pains or admitted for safe confinement at term for maternal or fetal indications. The meconium stained amniotic fluid was found after rupture of membrane either spontaneous or artificial. Neonates with congenital anomalies, stillborn and post caesarean pregnancy that underwent elective caesarean delivery and meconium was found in the amniotic fluid were excluded from the study. After applying the inclusion criteria, a total 340 cases of meconium in amniotic fluid was found who qualified for the study.

An analysis of the medical records was done and details recorded. The maternal attributes include maternal age, parity status, gestational age, onset of labour either spontaneous or induced, medical or obstetrical comorbidity during pregnancy, rupture of amniotic membrane either spontaneous or artificial, detection of meconium in early or advanced labour, cardiotocographic monitoring in labour after meconium detection: reassuring or non-reassuring in both stages of labour and its duration and mode of delivery. The neonatal attributes include birth weight and neonatal outcome in terms of asymptomatic at birth (Normal Apgar), requirement of endotracheal suctioning and NICU admission and development of meconium aspiration syndrome (MAS).

Protocol

Patients who reported in labour were directly taken in the labour room. They were observed for uterine contractions and simultaneously their vital parameters and admission nonstress test (NST) was taken. A per vaginum examination was done by duty nurse to access the cervical status. If no labour pains found or mild contractions noticed, then those patients were shifted to maternity ward. If patients reported in advanced labour, an artificial rupture of the membranes (ARM) was being done. There were many patients who were admitted at term with obstetrical condition like gestational hypertension, gestational diabetes (GDM), intra hepatic cholestasis of pregnancy (IHCP), oligohydramnios and planned for early delivery. They were induced with dinoprostone gel for poor Bishop score to make cervix favourable. A maximum of 03 dinoprostone gels were applied at 4 - 6 hrs. intervals. ARM was being done when the patient started getting labour pains and colour of liquor observed carefully. Mother was put on continuous electro fetal monitoring in cases of meconium-stained amniotic fluid. An oxytocin drip was started for labour augmentation. In case of fetal heart decelerations, mother was placed in left lateral position, oxytocin drip was stopped to improve uteroplacental perfusion, and hydration drip with 500 ml of ringer lactate was started. A dedicated nurse was placed at the bedside of the patient to access cardiotocography (CTG) tracing and the duty obstetrician was subsequently

informing. In case the progress of labour was satisfactory, no intervention was done. Caesarean was being performed in case there were repeated decelerations and other obstetrical reasons. Post in vitro fertilization (IVF) conceptions having meconium stained liquor (MSL) were taken for LSCS irrespective of the consistency of meconium as per protocol. All deliveries were attended by paediatrician and appropriate steps taken immediately to reduce the risk of serious consequences resulting from meconium aspiration. Routine care was given to neonates who were vigorous i.e., good respiration, good muscle tone and heart rate more than 100 / min. In case of non-vigorous neonates, drying was postponed to prevent stimulation, residual meconium in hypopharynx removed under direct vision by laryngoscope and endotracheal suctioning was done to remove meconium from beneath the glottis and put on oxygen. Neonates with low Apgar score were taken to NICU for subsequent management.

Statistical Analysis

Analysis of data was done by SPPS version 20. Frequency and its percentage in respect to thin and thick meconium was calculated for variables as maternal age, parity status, labour onset; spontaneous or induced, gestational age, maternal comorbidity, rupture of membrane, meconium detection in respect to early or advance labour, mode of delivery, non-reassuring CTG in various stage of labour and birth weight. Neonatal outcome in terms of asymptomatic at birth, endotracheal suctioning, NICU admission, MAS and neonatal death in respect to thick and thin meconium were analyzed. The chi square test was applied between grades of meconium to maternal parameters and neonatal outcome at 95 % confidence interval and the P value < 0.05 was considered to be statistically significant.

RESULTS

During the study period, a total no of 340 patients had meconium-stained amniotic fluid during labour. Out of 340 cases 252 (74.1 %) had thin and 88 (25.9 %) had thick consistency of meconium. The various maternal demographic characteristics in respect of consistency of meconium is shown in Table 1.

Majority of patients (65 %) were in the age group of 20 - 30 years having spontaneous (56 %) onset of labour. A total of 190 pregnancies were complicated by medical disorders as Gestational hypertension (HTN), GDM, hypothyroidism, IHCP and oligohydramnios. Many of them were admitted early in the maternity ward. They were induced with dinoprostone gel for cervical ripening and delivery. MSAF was detected more in early labour (244, 71.8 %), as compared to advanced labour (96, 28.2 %). Majority of cases had non-reassuring CTG in first stage, second stage or both stages. A total of 212 and 30 patients were delivered by vaginal route and 30 and 58 by LSCS in thin and thick meconium respectively and this difference was statistically significant (< 0.001).

The caesarean rate is more in primigravida as compared to multigravida in MSL. The factors contributing to this are early induction for maternal indication, Post IVF pregnancy, and detection of meconium in early labour and persistent non-reassuring NST. Being multiparous is associated as a protective factor both for mother and baby against the presence of MSAF. In multiparity the detection of meconium was in advanced labour, duration of labour was shorter and caesarean rate was lesser (Table 3) as compared to primigravida. Most of the neonates were sent back to mothers within 48 hrs. of NICU admission. Even neonates who developed MAS had good outcome in multiparity. Detection of meconium in advanced labour (cervical dilatation > 4 cm) had overall favourable outcome and lesser LSCS rate as compared to detection of MSL in early labour. NICU admission was more when duration of labour was more even in thin MSL group. Birth weight was another variable having impact on NICU admission.

Sl. No.	Maternal and Neonatal Factors	Type of Meconium Thin N = 252	Thick N = 88	P Value
1	Maternal age < 20 20 – 30 > 30	4 (1.59 %) 176 (69.84 %) 72 (28.57 %)	5 (5.58 %) 45 (51.14 %) 38 (43.18)	0.003
2	Labour onset spontaneous induced	141 (55.95 %) 111 (44.05 %)	49 (55.68 %) 39 (44.32 %)	0.999
3	Gestational age ≤40 weeks > 40 weeks	197 (78.18 %) 55 (21.83 %)	67 (76.14 %) 21 (23.86 %)	0.693
4	Maternal comorbidity nil present	108 (42.86 %) 144 (57.14 %)	42 (47.73 %) 46 (52.27 %)	0.456
5	Rupture of membrane spontaneous artificial	79 (31.35 %) 173 (68.65 %)	26 (29.55 %) 62 (70.45 %)	0.790
6	Detection of meconium early labour Advanced labour	185 (73.41 %) 67 (26.59 %)	59 (67.05 %) 29 (32.95 %)	0.272
7	Delivery vaginal LSCS	212 (84.13 %) 40 (15.87 %)	30 (34.09 %) 58 (65.91 %)	< 0.001*
8	Non-reassuring CTG first stage second stage	25 (9.92 %) 90 (35.71 %)	53 (60.23 %) 09 ((10.2 %)	< 0.001*

Table 1. Maternal Demographic Characteristics in MSL in Labour

*Significance Chi-square test

Sl. No.	Neonatal Outcome	Grade of Meconium Thin (N = 252)	Thick (N = 88)	P Value
1	Asymptomatic Yes (N = 199) No (N = 141)	166 (83.4 %) 86 (61 %)	33 (16.6 %) 55 (39 %)	< 0.001*
2	Endotracheal suction Yes (N = 101) No (N = 239)	69 (68.3 %) 183 (76.56 %)	32 (31.7 %) 56 (23.43 %)	0.112
3	NICU admission Yes (N = 40) No (N = 300)	17 (42.5 %) 235 (78.33 %)	23 (57.5 %) 65 (21.67 %)	< 0.001*
4	MAS (N = 40) * Yes (N = 20) No (N = 20)	02 (10 %) 15 (75 %)	18 (90 %) 05 (25 %)	< 0.001*
5	Neonatal death (N = 04) Yes (N = 04) No (N = 00)	0 0	04 (100 %) 0	Can't calculate

Table 2. Neonatal Outcome in Relation to Consistency of Meconium

*MAS developed in 20 neonates admitted to NICU
*Significance Chi-square test

Sl. No.	LSCS	LSCS (N = 98) Thin (N = 252)	Thick (N = 88)	Total	P Value
1	Primiparous (N = 150)	32	40	72	< 0.001*
2	Multiparous (N = 190)	08	18	26	

Table 3. LSCS Rate in Parity Group in MSL

*Significance Chi-square test

The duration of labour was more and CTG tracing was non-reassuring and it was associated with development of MAS. A majority of neonates (199) were asymptomatic at birth both in thin and thick MSAF group. Endotracheal suctioning was done in 101 neonates in both groups. They were active at birth and kept in labour room on oxygen for observation. Later on, 05 neonates were shifted to NICU. A total of 40 neonates were admitted to NICU for severe birth asphyxia. It was more in thick meconium as compared to thin MSAF. The criteria of NICU admissions were persistent tachypnoea, chest retractions, grunting and cyanosis. Most of the cases responded well to treatment. Meconium aspiration syndrome (MAS) was observed in 20 cases, out of which 18 were in thick meconium and 02 in thin meconium grade.

A total of 04 neonatal deaths occurred due to MAS. They were born to primigravida, had induced onset of labour with detection of thick meconium and delivered vaginally. Two of the mothers had GDM and one each had FGR and oligohydramnios. No neonatal death occurred in thin meconium group and neonates delivered by caesarean section.

DISCUSSION

MSAF and MAS is a troublesome situation both for obstetrician and paediatrician. The incidence of MSAF and MAS in our study was 9.5 % and 0.6 / 100 live birth respectively. Most of the study done worldwide has incidence of 10 - 16 % in low risk pregnancy.[10] The incidence of 0.6 % live birth is lesser as compared to study done by Singh et al.[11] A study done by Fisher in France in 2012 has prevalence of 0.07 %.[12] In this study, it was found that maternal age more than 30 years has increased incidence of MSAF. Pregnant women in this age group have more comorbidities such as gestational hypertension, gestational diabetes and obesity. It was in accordance of an English multicentric study.[13] There is a strong correlation between maternal gestational age > 41 weeks and incidence of MAS.[14,15] In this study, no such correlation was present. Out of 40 NICU admissions, 35 neonates were born to mothers less than 40 weeks' gestation.

All cases of MAS, mother's period of gestation was less than 40 weeks. Our study had 74.1 % cases of thin and 25.9 % thick MSAF. These findings were consistent with Nadia M, et al.[16] and Hanoudi et al.[17] but opposite of Khazardoost et al.[18] the occurrence of MSAF was more in multigravida in comparison to primigravida (190, 150). This was contrary to an Israeli study.[19] The caesarean delivery rate is more in primigravida. The reason of increased LSCS rate in primigravida is attributable to early induction for maternal and fetal indication in cases such as gestational HTN, GDM, intra hepatic cholestasis of pregnancy (IHCP) and bad obstetric history (BOH), low threshold of LSCS in post IVF pregnancies, and persistent non-reassuring NST in first and second stage of labour. The duration of labour is more in primigravida and obstetricians had been more aggressive while managing the labour. Cases of BOH where there had been many previous losses and post IVF pregnancies where conception had occurred after many years of marriage and many failed IVF attempts, the threshold of LSCS for the obstetricians was very low. On the other hand, multiparity status is found to be protective from LSCS. In multigravida the progress of labour is fast and lesser incidences of non-reassuring NST was noted. Our study had 72 and 26 cases of LSCS in primigravida and multigravida respectively and this difference was statistically significant ($p < 0.001$). It was more in thick meconium group found in early labour. A similar finding was observed in an Indian study by Kumar et al.[20]

Meconium stained amniotic fluid is associated with adverse neonatal outcome particularly in thick meconium. Meconium aspiration syndrome occasionally develops from thin meconium. When amniotic fluid is ample the thick meconium is diluted and cleared by fetal physiological mechanisms. This protection is lost in cases of placental insufficiency where the liquor is less. Majority of our cases had medical disorders in which there was chronic placental insufficiencies. During labour, the chances of cord compression is more and there is increased likelihood of meconium passage that is thick and undiluted.[21] Most of the studies done worldwide are in concurrence to this fact.[11,13,16,17] In our study, 40 neonates were admitted to NICU. It was more in thick meconium as compared to thin meconium group and this difference was statistically significant ($p < 0.001$). The management of neonates who had features of birth asphyxia was started just after delivery as per protocol. The response was favourable in neonates in whom the meconium was new onset,[22] labour duration was less than 3 hours, intrapartum CTG was reassuring and birth weight of neonates was less than 3 Kg.[23]

MAS is a known and deadliest complication of MSAF. The incidence varies between 1 - 6. 8 % in neonates of MSAF.[24] In our study, a total of 20 neonates had MAS with incidence of 0.6 %. Thick meconium was responsible for 18 and thin meconium was responsible for 02 cases and this difference was statistically significant ($p < 0.001$). The factors associated with MAS in our study are parity status, onset of labour, detection of MSL in respect to labour, maternal comorbidity, labour duration, mode of delivery and birth weight. Multiparity, spontaneous onset of labour, birth weight less than 3 kg, shorter duration of labour, early LSCS was associated with favourable outcome even in thick meconium. No aspect of the transition from fetal to neonatal life is more dramatic from the process of pulmonary adaptation. In our study four neonates could not survive because of delay in the pulmonary adaptation caused by inhalation of thick meconium. They all were born vaginally to primigravida mother having thick meconium. The labour duration was more than 3 hrs associated with birth weight more than 3.5 kg with repeated episodes of fetal distress. The cause of death was severe birth asphyxia (03 cases) and perinatal infection (01 case).[7,9,11,13]

CONCLUSIONS

Meconium stained amniotic fluid (MSAF) is a common obstetric entity. The occurrence of MSL is more in obstetrical

conditions that lead to placental insufficiency. It is associated with increased incidence of caesarean section, lower Apgar score, NICU admissions, development of meconium aspiration syndrome and neonatal death. Being physiological, the condition cannot be stopped. Obstetrician should be more vigilant while dealing with cases of MSAF particularly of thick type in primigravida and high-risk pregnancies. A timely caesarean section improves the neonatal outcome.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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