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APGAR scores and perinatal outcome in neonates born with meconium stained amniotic fluid

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Abstract
Background and Objectives: Meconium-stained stained amniotic fluid (MSAF) is the result of passage of meconium in utero by the fetus antenatally or during labor process. However, MSAF is considered an alarming sign of fetal compromise and its occurrence is associated with a poor perinatal outcome. There is growing evidence that indicates its association with increased incidences of meconium aspiration syndrome, operative delivery, respiratory distress, neonatal sepsis, need for resuscitation, neonatal intensive care admission, and low Apgar score. The present study was undertaken to determine the maternal factors and neonatal outcome of pregnancies complicated by meconium stained amniotic fluid.
Methodology: We conducted this prospective case control study over 1 year from January 2017 to December 2017 at NICU of a tertiary care level Medical College in Bihar including neonates of gestational age >35 weeks born with MSAF and with no congenital anomalies. Maternal factors, APGAR score and short term outcome of neonates were compared in MSAF group and control group. Immediate perinatal outcome was also compared between neonates born with thin and thick meconium.
Results: During the study period, we enrolled 152 neonates born with MSAF. Mean birth weight of neonates with MSAF was 3.28 kg ± 0.42 Kg. LBW was seen in 12 (7.9%) of these neonates. 94 (61.8%) were born by assisted or unassisted vaginal delivery while 58 (38.2%) were born by cesarean section. Mean Gestational age was 39.8 ± 1.7 in MSAF group and 38.7 ± 1.67 in control group. Primigravida mothers were more likely to give birth to neonates with MSAF. MSAF was found to be a risk factor for operative delivery. Both the 1 min APGAR score (6.1 ± 0.82 vs 8.2 ± 0.43, p <0.01) as well as 5 minute APGAR score (6.9 ± 0.95 vs 8.79± 0.31, p <0.01) were significantly lower in MSAF group as compared to controls. Neonates born with thick MSAF were more likely to be suffering from adverse immediate neonatal outcome as compared to neonates born with thin MSAF. Overall, neonates born with MSAF had a significant higher incidence of respiratory support, days of ventilator support, days of hospital stay and complications like EONS, HIE as well as mortality as compared to controls.
Conclusion: Occurrence of MSAF is a worrisome phenomenon as this condition is a significant contributor to neonatal morbidity and mortality. Of particular concern is its association with an increased risk of operative delivery, perinatal asphyxia, requirement of extensive resuscitative efforts, neonatal sepsis, NICU admissions and respiratory support.

Keywords: amniotic fluid, meconium stained, meconium aspiration syndrome, MSAF

Introduction

Amniotic fluid is actually a straw color fluid produced inside the amniotic sac that surrounds the developing fetus and provides a medium for healthy development of the baby. This fluid is essentially harmless to the baby as the same is normally swallowed as well as aspirated inside lungs by the developing fetus [1]. Meconium is basically a muco-viscidic odorless substance present in fetal intestines which is programmed to be passed out as first stools of the baby by 24 hours of birth. Meconium-stained stained amniotic fluid (MSAF) is the result of passage of meconium in utero by the fetus antenatally or during labor process. However, MSAF is considered an alarming sign of fetal compromise and its occurrence is associated with a poor perinatal outcome [2, 3]. Placental insufficiency, maternal hypertension, pre-eclampsia, oligohydramnios or maternal drug abuse (tobacco, cocaine) are believed to be the predisposing factors for in utero passage of meconium [4]. The incidence of MSAF increases from 1.6% at 34-37 weeks to 30% at >42 weeks of infants born through MSAF [5]. MSAF is seen in 7-22% of all deliveries, whereas meconium aspiration syndrome (MAS) occurs only in approximately 5% of all cases of MSAF [6]. Passage of meconium in utero may either represent a physiological process related to gastrointestinal maturation (as this event is quite rare before 35 weeks of gestation) or it may indicate an acute or chronic hypoxic event as fetal hypoxia is believed to facilitate fetal evacuation of meconium [7]. Thereby its presence strongly suggests a potential warning sign of fetal Compromise. Though it is difficult to differentiate physiologic from pathologic meconium staining of amniotic fluid, there is a growing evidence that indicates its association with increased incidences of meconium aspiration syndrome, operative delivery, respiratory distress, neonatal sepsis, need for resuscitation, neonatal intensive care admission and low Apgar score [8]. Not surprisingly, many neonates born through meconium-stained amniotic fluid are at an increased risk of suffering from respiratory distress within few hours of birth that may require extensive support or even lead to death. Meconium aspiration syndrome (MAS) is defined as development of respiratory distress with radiographic evidence of aspiration pneumonitis in a neonate born in the presence of meconium-stained amniotic fluid. MAS occurs in about 5% of deliveries with meconium-stained amniotic fluid and death occurs in about 12% of infants with MAS [9]. Thus, MSAF

detected during delivery is a significant contributor to perinatal and neonatal morbidity and mortality.

The findings of poor perinatal outcome associated with meconium-stained amniotic fluid warrants a well-designed study. However, there is paucity of well-designed comparative study in our country in general and such a study has not been conducted at our tertiary care level teaching hospital in recent years on the above subject matter. Identification of maternal factors may also help to anticipate the need for neonatal resuscitation. Based on this background we intended to study the association of maternal factors, APGAR scores and perinatal outcomes in newborn born with meconium stained amniotic fluid.

Aim and Objectives

Aim

To study maternal and neonatal parameters in pregnancies complicated by MSAF.

Objective

1. To study the maternal factors in Meconium Staining of Amniotic Fluid.
2. To study the APGAR score and short term outcome of neonates born with MSAF.
3. To compare the immediate perinatal outcome in thin and thick meconium.

Methodology

Study Setting

NICU of deptt of Pediatrics, ANMMCH Gaya.

Study design

Prospective case control study.

Study duration

1 year from January 2017 to December 2017.

Inclusion criteria

Neonates of gestational age >35 weeks born with MSAF and with no congenital anomalies were included in our study.

Exclusion criteria

Pregnant women with gestational age <35 weeks, twin pregnancy and those with an unknown dates of last menstrual period or without early ultrasound report were excluded.

Study technique

After obtaining written informed consent from either parent, we enrolled participants in our study. Gestational age was estimated from dates of last menstrual cycle or early ultrasound done before 24 weeks. Those with MSAF were exposed group labelled as "cases", and those with clear amniotic fluid were non-exposed groups labelled as "control" group". For each neonate born with MSAF, we carefully chose a 'control' of comparable birth weight. A pre-designed proforma was used to collect data regarding basic demographic information, gestational age, birth weight, gender of baby, booking status of mother, parity, maternal clinical characteristics, medical and obstetric complications during pregnancy, intrauterine growth restriction, premature rupture of membrane (PROM), grades of meconium, mode of delivery, neonatal outcome (APGAR score, type of resuscitation, meconium aspiration syndrome and need for admission in nursery). Primary variables studied were: 1st and 5th minute Apgar score, incidence of MAS, perinatal asphyxia as well as HIE, requirement of NICU admission, early-onset neonatal sepsis (EONS), duration of type of intervention needed and early neonatal death. Consistency of meconium was categorized into thick and thin. Thick greenish meconium with particulate matter in amniotic fluid was considered as thick meconium while thin meconium was defined as light greenish staining of amniotic fluid. We also intended to compare characteristics of neonates in the two grades of meconium to identify any significant difference between the two groups in terms of neonatal outcomes.

Statistical analysis

Information so obtained was recorded, tabulated and entered in Microsoft excel sheet and analyzed by using SPSS ver.21® software. Variables were expressed as mean, standard deviation and proportions or percentiles as applicable. Dichotomous variables were compared using Chi-square test whereas continuous variables were compared using Student t-test. P-value <0.05 was taken as significant.

Observation Results

During the study period, we enrolled 152 neonates born with MSAF. Mean birth weight of neonates in MSAF group was 3.28 kg ± 0.42 Kg, range: 1.84-4.7 kg. LBW was seen in 12 (7.9%) of these neonates. 94 (61.8%) were born by assisted or unassisted vaginal delivery while 58 (38.2%) were born by cesarean section. Table 1 depicts the general characteristics of our study population.

Table 1: Maternal demographic factors in study and control groups

Demographic characteristics	MSAF group N=152	Control group N=152
Gestational age (Mean ± SD)	39.8 ± 1.7	38.7 ± 1.67
Maternal Age (Mean ± SD)	26.8±3.4	27.4 ± 3.7
Booking status: Booked (number; percentage)	73; 48%	81; 53.3%
Booking status: Unbooked (number; percentage)	79; 52%	71; 46.7%
Primipara (number; percentage)	95; 62.5%	61; 40.1%[#]
Pregnancy induced hypertension (number; percentage)	14; 9.2%	17; 11.2%
Gestational Diabetes or Diabetes mellitus (number; percentage)	19; 12.5%	16; 10.5%
Anemia in pregnancy (number; percentage)	89; 58.5%	77; 50.7%
PROM (number; percentage)	13; 8.5%	18; 11.9%
IUGR (number; percentage)	16; 10.5%	19; 12.5%
Cesarean delivery	58; 38.2%	34; 22.4%[*]
Thin MSAF (number; percentage)	119; 78.3%	0; 0%
Thick MSAF (number; percentage)	33; 21.7%	0; 0%

(# statistically significant difference with p<0.001;* statistically significant difference with p= 0.003)

We also studied the relationship between consistency of MSAF (thin vs thick) and neonatal outcome as shown below in table 2. Low APGAR score, Non-reassuring CTG, requirement of resuscitation, requirement of endotracheal suction, requirement of oxygen support, incidence of MAS and mortality were significantly associated with thick meconium stained liquor. Not surprisingly, neonates born with thin MSAF were more likely to be asymptomatic at

birth.

Table 2: Immediate Neonatal outcome in relation to grade of consistency of meconium

Neonatal Outcome	Thin MSAF (n=119)	Thick MSAF (n=33)	*p*-value
NICU admission not required	93 (78.15%)	17 (51.51%)	0.002
APGAR score <7 at 1 min of age	11 (9.2%)	12 (36.4%)	<0.001
LBW	07 (5.9%)	5 (15.2%)	0.08
IUGR	10 (8.4%)	6 (18.2%)	0.10
Non-Reassuring CTG	31 (26.1%)	18 (54.5%)	0.002
Required resuscitation at birth	13 (10.9%)	15 (45.5%)	<0.001
Required endotracheal suctioning	3 (2.5%)	7 (21.2%)	<0.001
Required oxygen support	17 (14.3%)	16 (48.5%)	<0.001
MAS	15 (12.6%)	13 (39.4%)	<0.001
Emergency Cesarean section	41 (34.5%)	17 (51.5%)	0.07
Death	10 (8.4%)	7 (21.2%)	0.04

Meconium staining of amniotic fluid is considered as an indirect indicator of fetal hypoxia. Prolonged fetal hypoxia leads to perinatal depression which becomes evident as low Apgar score. Table 3 depicts 1st and 5th minute Apgar scores in the study group and control group. It denotes that neonates born with MSAF have significantly lower APGAR scores as compared to neonates born with a clear fluid and a possibly higher risk of requirement of resuscitation at birth in MSAF group.

Table 3: APGAR scores at 1 min and 5 minutes of age

Parameter studied	MSAF group (n=152)	Control group (n=152)	P value
APGAR score at 1 minute of age (mean± SD)	6.1 ± 0.82	8.2 ± 0.43	<0.001
APGAR score at 5 minutes of age (mean± SD)	6.9 ± 0.95	8.79± 0.31	<0.001

Based on the above observations we also compared the morbidity and mortality in MSAF group and control group as shown below in table 4. In univariate analysis, neonates born with MSAF were more significantly associated with requirement of oxygen support as well as mechanical ventilator support, occurrence of perinatal asphyxia, HIE and EONS and mortality. They also were more likely to require interventions for a significantly longer duration in terms of duration of ventilator and hospital stay.

Table 4: Morbidity and mortality in MSAF group vs control group:

Parameter studied	MSAF group (n=152)	Control group (n=152)	P value
Oxygen requirement (number; percentage)	47 (30.9%)	11 (7.2%)	<0.001
Mechanical ventilator requirement (number; percentage)	15 (9.9%)	3 (2%)	0.004
Duration of ventilator requirement (mean ± SD)	5.4 ± 2.3	3.7 ± 1.9	<0.001
Duration of hospital stay (mean ± SD)	7.6 ± 3.4	5.9 ± 2.8	<0.001
Perinatal asphyxia (number; percentage)	23 (15.1%)	7 (4.6%)	0.002
Hypoxic ischemic encephalopathy (number; percentage)	13 (8.6%)	4 (2.6%)	0.02
Early onset neonatal sepsis (number; percentage)	18 (11.9%)	6 (3.9%)	0.01
Mortality (number; percentage)	17 (11.2%)	7 (4.6%)	0.03

Discussion

In the present study we intended to study the problems associated with birth of a neonate with MSAF at our tertiary care level teaching hospital. Even with improved perinatal care, thousands of neonates every year have to suffer from the consequences of having born with a MSAF.

Incidence of MSAF varies from 12 to 20% and this is higher in developing countries. In our study, incidence of MSAF was 82.3/1000 deliveries. Baseline characteristics were similar in the control and MSAF group except for Primigravida which had a significantly higher association with MSAF. This might be explained by slow and protracted progress of labor in primigravida women which might increase the possibility of meconium passage in utero. This is similar to a recent study done by Tolu LB [10] et al. We also noticed that as gestational age (GA) increased, the incidence of MSAF also increased. Nearly 95% of neonates with MSAF had GA more than 38 weeks and the 'mode' value of gestational age in our study was 41 weeks as compared to 38 completed weeks in the control group. This is quite comparable to the findings of Desai et al [11] in the year 2017. Naveen et al [12] reported that Cesarean sections were conducted twice as frequently in women with MSAF. In the present study we also found that MSAF group was nearly two times more likely to be born of operative delivery as compared to the control group. Higher occurrence of LSCS can also be partly explained by the fact that obstetricians tend to be more aggressive in managing labor with MSAF. In this study, we observed that 78.3% of cases had thin MSAF, while 21.7% had thick meconium. These findings are comparable with the findings of Hanoudi at al [13]. Neonates born with thick meconium were more debilitated and more frequently required NICU admissions as compared to neonates born with thin MSAF (p-value 0.001). This was also the case in study of Desai et al [11]. However, it was also seen than majority of neonates in the both groups (thin and thick) did not usually require resuscitation and remained asymptomatic. It was noticed that requirement of resuscitation, endo-tracheal suctioning, oxygen support and incidence of MAS were significantly associated with thick MSAF group (p-<0.05). MAS is perhaps the most severe complication of MSAF the incidence of which varies from 1-6.8% in babies born with MSAF. In our study, however we found that MAS occurred in 18.4% of MSAF cases and its occurrence was significantly higher in neonates born with thick meconium rather than thin meconium (p-value <0.001). Higher incidence of MAS in our study can be partly explained by the occurrence of hospital bias. Occurrence of MAS has been found to be an independent factor for NICU admissions, long term morbidity and mortality by researchers worldwide. It is therefore imperative to develop practical strategies to prevent MAS. Mundhra et al [14], showed that APGAR scores at 1 and 5 minutes in neonates born with MSAF was significantly lower when compared with controls which very well correlates with the findings of present study. Several investigators have demonstrated association between MSAF and poor perinatal outcome. Jain et al [15] in their Indian study concluded that in utero meconium passage can be attributed to response of the fetus to intrauterine stress and is frequently associated with fetal hypoxia, asphyxia and acidosis. In our study, above observations were reinforced as neonates born with MSAF had a significant higher incidence of respiratory support,

days of ventilator support, days of hospital stay and complications like EONS, HIE as well as mortality.

Conclusion

Occurrence of MSAF is a worrisome phenomenon as this condition is a significant contributor to neonatal morbidity and mortality. Of particular concern are its association with an increased risk of operative delivery, perinatal asphyxia, requirement of extensive resuscitative efforts, neonatal sepsis, NICU admissions and respiratory support. It is therefore imperative to closely monitor, early and timely obstetrical intervention and appropriate post natal care in all deliveries complicated by MSAF in order to improve perinatal outcome.

Limitation

First limitation is that the present study was a single centre study. Second limitation is the relatively small sample size. Third limitation is that we didn't study the contribution of individual factors which were associated with MSAF and could have confounded our results.

Conflict of interest

None

Financial disclosure

We declare that our study hasn't received any financial grant or sponsorship.

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