

Original Research Article

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Maternal risk factors and meconium stained amniotic fluid

Onkar S. Bhinder^{1*}, Gurmeet Singh², Karuna Thapar², Priyanshu Nain³

¹Department of Pediatrics, ³Maulana Azad Medical College, Delhi, India

²Department of Pediatrics, SGRDIMSAR, Amritsar, Punjab, India

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***Correspondence:**

Dr. Onkar S. Bhinder,

E-mail: o.bhinder@gmail.com

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ABSTRACT

Background: Meconium is a sterile, thick, black-green, odourless material that results from accumulation of debris in fetal intestine during the third month of gestation. The risk factors for meconium-stained amniotic fluid (MSAF) are both maternal and fetal. MSAF is associated with higher rate of caesarean delivery, increased need for neonatal resuscitation and meconium aspiration syndrome. This observational study was undertaken so that such expecting mothers can be screened at an early stage and prompt intervention can be done to minimize neonatal morbidity and mortality.

Methods: This prospective observational study was conducted in department of paediatrics of Sri Guru Ram Das University from December 2014 to June 2016 included all deliveries with meconium stained amniotic fluid excluding Twins, neonates with congenital malformations, multi organ dysfunction or requiring surgical intervention.

Results: The incidence of MSAF was 3.42% with 10.5% mortality. Various maternal factors including multiparity, bad obstetric history, pregnancy-induced hypertension (PIH), intrauterine growth restriction (IUGR), maternal diabetes, anaemia and non-reassuring cardiotocography (CTG) record were found to be statistically important and associated with poor outcome.

Conclusions: MSAF and poor neonatal outcome is related to antenatal care. Thus, good antenatal and perinatal care can prevent morbidity and mortality in neonate by early identification of signs of fetal distress and passage of meconium in utero and improve outcome.

Keywords: MSAF, Meconium, Meconium aspiration syndrome

INTRODUCTION

Meconium is a sterile, thick, black-green, odourless material that results from accumulation of debris in fetal intestine during the third month of gestation.¹ In the fetus, passage of meconium occurs physiologically early in gestation, when it contributes to alkaline phosphatase in amniotic fluid but diminishes after 16 weeks and ceases by 20 weeks, concurrent with innervation of the anal sphincter and the rectum appears to be filled with meconium.² Meconium passage in utero and its relationship to fetal and neonatal compromise are matters

of great concern in maternal-fetal medicine and neonatology.

The passage of meconium by the fetus occurs in 10-15% of all deliveries whereas the meconium aspiration syndrome occurs in 10% to 30% of all meconium stained infants and 1-3% of all live born infants.³ This can result in severe respiratory distress, meconium aspiration syndrome; 30% require mechanical ventilation and 3-5% die.⁴

The risk factors for meconium-stained amniotic fluid (MSAF) are both maternal and fetal.⁵ A number of

maternal factors have been shown to be attributable to MSAF and thus perinatal morbidity and mortality in developed countries. The maternal factors implicated are maternal age >30, primigravida, post-term pregnancy, anaemia, chorioamnionitis, prolonged labour, hypertension, gestational diabetes mellitus (GDM), smoking, maternal chronic respiratory or cardiovascular diseases. Aspiration of meconium by the fetus remains relatively common cause of perinatal morbidity and mortality because it is difficult to prevent. MSAF is associated with higher rate of caesarean delivery, increased need for neonatal resuscitation and meconium aspiration syndrome.⁶ The objective of this study was to identify the maternal risk factors associated with inutero passage of meconium. Meconium stained amniotic fluid is associated with prolonged hospital stay and adverse outcome in fetus and as there were no significant data in our country, this observational study was undertaken so that such expecting mothers can be screened at an early stage and prompt intervention can be done to minimize neonatal morbidity and mortality.

METHODS

This prospective observational study was conducted in department of paediatrics of Sri Guru Ram Das University from December 2014 to June 2016 after clearance from the institutional ethical committee. Study group comprised of all the neonates fulfilling the inclusion criteria. Purpose of study was explained to parents and written informed consent were obtained at time of enrolment.

Inclusion criteria

The selection criteria of this study population included all neonates born during the study period with visible staining of amniotic fluid with meconium after taking written informed consent of parents.

Exclusion criteria

Twins, neonates with congenital malformations, multi organ dysfunction and those requiring surgery like intestinal obstruction, and ARM were excluded from this study.

This study was meant for finding out maternal risk factors associated with MSAF. In all study subjects maternal history including age, parity, previous abortion, previous still birth was noted. Obstetric risk factor such as obstructed labour, pregnancy induced hypertension (PIH), intra uterine growth retardation (IUGR), oligo/polyhydramnios, malpresentation, ante partum haemorrhage (APH), post maturity, pre mature rupture of membranes (PROM), gestational diabetes mellitus (GDM), and premature onset of labour was also noted. Maternal medical history such as diabetes mellitus (DM), hypertension, fever, jaundice, urinary tract infection (UTI), and anaemia was also noted. Cardiac tocography record (CTG) was analysed for heart rate variability during

delivery and delivery was attended by a paediatrician to record perinatal events in association with obstetricians.

Ethical approval

This study was approved by Sri Guru Ram Das University, Amritsar, Punjab ethics committee.

Statistical analysis

All data was recorded and analysed using windows based statistical package for the social sciences (SPSS) version 20.0 and Chi square test/Fischer's exact test were used to find the association between diagnosis and various data variables associated with diagnosis. P value of <0.05 was considered to be significant.

RESULTS

Total number of neonates born during study period, from 01 December 2014 to 01 June 2016, in SGRDIMSAR, Sri Amritsar were 2479. Out of 2479 deliveries, 3.42% (n=85) had MSAF and 96.58% were without MSAF. Out of 85 inborn neonates, 96.5% had more than 3 antenatal visits.

Table 1: Relation between type of delivery and final outcome.

Type of delivery (inborn)	Died (%)	Discharged (%)	Total (%)
Vaginal delivery	1 (4.5)	22 (95.5)	27.1
LSCS	8 (13)	54 (87)	72.9

P<0.05, statistically significant

Out of 85 inborn deliveries, 9 neonates died. Maximum mothers were in age group 25-29 years (40%) cases followed by age groups 20-24 years, 30-34 years, >35 years and <20 years with 33%, 19%, 4.5% and 3.5% cases respectively. As shown in Table 2, MSAF was found to be more common in nulliparous females but shows good foetal outcome if mother has no previous abortion, still birth and no bad obstetric history (statistically significant).

Table 2: Maternal obstetric history in relation to neonatal outcome in intramural neonates.

Maternal obstetric history	Outcome (%)		P value
	Died	Discharged	
Parity=1 (n=54)	3 (5.5)	51 (94.5)	0.05
Parity≥1 (n=31)	6 (20)	25 (80)	
Abortion=0 (n=74)	6 (8)	68 (92)	0.08
Abortion ≥1 (n=11)	3 (27)	8 (73)	
Still birth=0 (n=78)	5 (6.5)	73 (93.5)	0.001
Still birth ≥1 (n=7)	4 (57)	3 (43)	
Bad obstetric history present (n=6)	4 (66)	2 (34)	0.000

Table 3 shows the effect of maternal obstetric risk factors on foetal outcome in neonates with MSAF. There was increased risk of poor outcome in MSAF if mother had PIH and IUGR (statistically significant).

Table 3: Maternal obstetric risk factors in relation with foetal outcome in inborn neonates.

Risk factor	Outcome (%)		P value
	Died	Discharged	
Obstructed labour	0	2	0.518
PIH	4 (26)	11 (74)	0.04
IUGR	3 (42)	4 (58)	0.02
Oligohydramnios	4 (20)	17 (80)	0.21
Polyhydramnios	0	2	0.54
Malpresentation	0	3	0.444
APH	0	2	0.622
Post maturity	0	6	0.852
PROM	1 (14)	7 (86)	0.85
GDM	1 (10)	9 (90)	0.255
Premature onset of labour	0	1	0.661
No history available	0	56	

Table 4: Maternal medical risk factors in relation to final neonatal outcome.

Risk factor	Died (%)	Discharged (%)	P value
DM	2 (66)	1 (34)	0.015
Hypertension	1 (50)	1 (50)	0.502
Jaundice	n=0	1	0.661
Fever	1 (25)	3 (75)	0.964
UTI	1 (17)	5 (83)	0.899
Anaemia	4 (17)	20 (83)	0.041
Others	0	3	0.444
No maternal medical risk factor	5	64	

Table 5: CTG record in inborn neonates in relation to neonatal outcome.

Cardiac tocography record	Inborn (%)		
	Total	Died (n=9)	Discharged (n=76)
Acceleration	55 (64.7)	1 (4)	55 (96)
Deceleration	19 (21.2)	1 (17)	17 (83)
Variable deceleration	10 (13)	7 (78)	3 (12)
Not available	1 (1.1)		1

P=0.003, highly significant

Maternal medical risk factors, in inborn neonates with MSAF, in relation to mortality, were assessed and maternal diabetes mellitus and maternal anaemia has significant association with adverse foetal outcome while

other factors including hypertension, jaundice, fever, and UTI did not show any statistical significance.

CTG record was analysed for heart rate variability during delivery. CTG record was available for 84 inborn neonates but was not available for one inborn. Neonates with deceleration and variable deceleration were found to have more mortality and the association was statistically significant.

DISCUSSION

Out of 2479 deliveries during study period, 3.42% (n=85) deliveries had MSAF while Jeena et al, Saldana et al and Hanoudi et al reported the Incidence of MSAF as 4.8%, 2.2% and 4.8% respectively.⁷⁻⁹ Higher incidence (8 to 22%) of MSAF has been reported in various studies.^{5,10-12} Incidence of MSAF was 8.4% (n=12156) and the incidence of MAS was 15.6% of MSAF deliveries in national neonatal perinatal database (NNPD).¹³ The incidence was low in our study because intramural neonates were exclusively considered for incidence of MSAF while it was not specified by other studies. Better antenatal care and early identification of high risk pregnancies and appropriate management might also have contributed to this.

In our study 96.5% of intramural mothers had more than three antenatal visits throughout pregnancy. Khatun et al observed that in MSAF cases, antenatal visits were less frequent (p<0.05).¹⁴ Similar findings were reported by Chakraborty et al, Sankhyan et al and Hanoudi et al.¹⁵⁻¹⁷ Increased number of antenatal visits and therefore improved antenatal care provided to mothers resulted in decreased incidence of MSAF in present study.

In our study, 38% neonates were delivered by vaginal delivery while 62% by lower segment caesarean section (LSCS). In similar study by Chand et al 48% were LSCS and 52% were vaginal deliveries.¹⁸ Similarly, Urvashi et al, Sankhyan et al, Narang et al, Sori et al and Afsar et al noted an increase in number of LSCS ranging from 45% to 71.66% in MSAF.^{16,19-22} Increase in incidence of LSCS in our study was seen which may be due to good foetal monitoring during delivery and resorting to LSCS at earliest sign of foetal distress. Moreover, our centre being a tertiary care centre, serves as a referral unit thus receiving more complicated cases from other centres of city and nearby PHC's and CHC's.

In our study 64.7% neonates with MSAF were born to primigravida mothers while 35.3% to multigravida mothers with more neonatal mortality in primigravida mothers. Sankhyan et al reported that 56.6% mothers were primigravida.¹⁶ Narang et al reported that 57.14% were primigravida mothers while David et al reported 52.5% primigravida mothers which were consistent with our findings.^{20,23} Similarly, Urvashi et al reported that 45% mothers were primigravida while 55% multigravida.¹⁹ Afsar et al in their study concluded that MAS was more

common among primiparous (60%) mothers than multiparous (40%) mothers with more mortality but the difference was not significant ($p>0.05$).²² This was similar to the present study that MSAF was more common among primi gravid mothers. Sori et al reported that 66.8% mothers were primigravida in their study.²¹ In the present study, maternal parity, previous abortion and still birth had significant effect on outcome in current pregnancy ($p<0.05$).

Maternal risk factors which were evaluated in the present study were maternal anaemia present in 26.4% cases, oligohydramnios (26.4%), polyhydramnios (1.6%), cord problem like cord around neck, and true knot (15.2%), pregnancy induced hypertension (13.6%), gestational diabetes mellitus (12.8%), post maturity (10.4%), intra uterine growth retardation (9.6%), premature rupture of membranes (9.6%), urinary tract infection (5.6%), fever (4.8%), malpresentation (2.4%), ante partum haemorrhage (2.4%), hypertension (2.4%), diabetes mellitus (2.4%), obstructed labour (1.6%), jaundice (0.8%), premature onset of labour (0.8%). In our study, PIH, IUGR and maternal DM were risk factors with poor outcome in current pregnancy and were statistically significant ($p<0.05$). Chand et al reported that 7% and 17% mothers with MSAF had diabetes mellitus and PIH respectively.¹⁸ Hanoudi et al in Iraq observed that 5.2% mothers had DM, 12.2% had hypertension and 38.5% had UTI.¹⁷ Their incidences were much higher than what we observed in our study. This could be due to poor ANC, health care facilities, and low literacy level in post war era in their country. Urvashi et al reported that IUGR was seen in 11% cases, pre-eclampsia in 8%, anaemia in 6.5%, eclampsia in 2%, heart disease in 0.5%, jaundice in 0.5% and asthma in 0.5% cases which was similar to our study but our study did not have any mother with heart disease.¹⁹ Sankhyan et al in their study found that primigravida, postdated pregnancy, anaemia, chorioamnionitis, prolonged labour, foetal distress, cord problems and IUGR were significant factors with $p<0.05$. They reported that 10.7% had PIH, 1.3% had APH, 13.2% had IUGR, 12.67% had PROM, 10.1% had cord problems and 2.5% had prolonged labour and their findings were consistent with present study.¹⁶ David et al reported that obstructed labour, prolonged duration of labour and PROM had significant association with MSAF ($p=0.001$).²³ Sori et al reported prolonged duration of labour in 31% mothers with MSAF.²¹ Sankhyan et al in their study also found that 54.1% mothers had anaemia, 1.3% had UTI.¹⁶ As quoted by Asgharnia, mothers with decreased amniotic fluid index have a higher rate of neonatal complications like perinatal asphyxia, foetal distress, meconium and the ensuing multi system dysfunction.²⁴ Antenatal chronic hypoxia is associated with accelerated placental aging with loss of placental nutritive function and a reduction in the amniotic fluid.

Oligohydramnios was present in 24% deliveries and associated with 5% mortality; high risk was seen but it was not statistically significant ($p>0.05$ and RR of 1.501; 95%

confidence interval). This was in contrast with the study conducted by Rabie et al concluded that there is increased risk of MSAF with oligohydramnios (RR of 1.32; 95% confidence interval).²⁵

In our study, during partographic monitoring, 21.2% had deceleration and 13% had variable deceleration. In a study by Berkus et al, meconium group had significantly higher risk of an abnormal fetal heart rate tracing in each stage of labor.²⁶

Naveen et al, in similar study found that 27% had abnormal fetal heart rate pattern and fetal distress which was consistent with our study.¹⁶ Sori et al in their study concluded that 16% had deceleration and 2% late deceleration during intrapartum heart rate monitoring thus increased operative intervention.²¹

In present study, non-reassuring foetal heart rate was observed in 29 cases out of which 34% ($n=8$) neonates died and was statistically significant ($p<0.05$). Similar findings were reported by Chand et al.¹⁸ Fenton and Steer found a perinatal mortality of 21.4%, similar to present study, when foetal heart rate was 110 beats per minute or less in presence of meconium.²⁷ Resnick observed a perinatal mortality of 32% in presence of an abnormal foetal heart rate pattern when meconium was present which was consistent with our study.²⁸ Mahomed et al in their study, observed that the incidence of FHR abnormality was not significantly different in those with clear liquor and with thin meconium but increased to 26.6% in those with thick meconium and was associated with an increased risk of operative delivery, low Apgar scores, respiratory distress and perinatal mortality.²⁹ As outcome appears to be so dependent on FHR, early detection of any abnormality in the FHR rate would be extremely important. Thus not only in cases of meconium, FHR monitoring is required in all high risk cases to avoid adverse perinatal outcome. Small sample size, no control group were the limitations of the study.

CONCLUSION

Maternal parity, history of still birth and bad obstetric history significantly affects outcome in current pregnancy. Among maternal risk factors, PIH, IUGR and maternal diabetes mellitus were significantly affecting foetal outcome in MSAF ($p<0.05$). Non assuring Foetal heart rate variation in cases of MSAF significantly affected mortality ($p=0.003$). MSAF and poor neonatal outcome is related to antenatal care. Thus, good antenatal and perinatal care can prevent morbidity and mortality in neonate by early identification of signs of fetal distress and passage of meconium in utero and improve outcome.

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