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A Comparative Study of Associated Factors for Intrapartum Meconium Staining of Amniotic Fluid in a Tertiary Care Hospital

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Abstract

Aims and Objectives:

- To study factors associated with intra-partum meconium stained liquor &feto maternal outcome.
- To compare the fetal outcome in relation to MSAF and clear amniotic fluid also in thick v/s thin meconium.

Material and methods: This study prospective of 100 subjects was done in a tertiary care hospital over six months. Fifty with MSAF detected at any time during the course of labour or prior to it were enrolled in the study group. The inclusion criteria were, a singleton, cephalic, term pregnancy without anomalies. For control, the next woman giving birth following the index patient who satisfied similar inclusion criteria and had clear amniotic fluid was selected.

Result: Among risk factors, preeclampsia p=0.04, fetal growth restriction p=0.05, fetal distress p=0.0002 and labour dystocia p=0.0009 were found to be statically significant. Caesarean section was considerably higher in patients with MSAF, p=<0.001. 66% patients with MSAF had FHR abnormalities as compared to 2% controls. 47.6% babies with thin MSAF and 75.8% of babies with thick MSAF had nonreassuring CTG. 42% patients had thin meconium and 58% patient had thick meconium.

***Conclusion*:** Women with prelabour or early labour rupture of membranes were noted to have a higher association with MSAF. Presence of thick MSAF, necessitates intensive monitoring of labour including surveillance of fetal wellbeing to optimise the neonatal outcome. Vigilance during labour and timely referral to higher centre/ availability of trained staff for neonatal resuscitation and management is the key to reducing neonatal morbidity and mortality associated with MSAF.

Keywords : Meconium; Amniotic fluid; Apgar score; Meconium aspiration syndrome.

Introduction

Meconium staining of amniotic fluid (MSAF) has for long been considered to be a predictor of adverse fetal outcome, and meconium aspiration syndrome, a major cause of perinatal morbidity and mortality. It has been associated with poor perinatal outcome including low APGAR scores, increased rate of chorioamnionitis, increased incidence of neonatal intensive care admission and high rate of perinatal death.[1]

Incidence of meconium passage is less before 34 weeks of gestations and after 37 weeks its incidence increases steadily with increasing gestational age reflecting the maturation of fetal intestinal myelination and parasympathetic innervations, 10% at 36 weeks, 30% at 40 weeks and 50% at 42 weeks. Infants born through meconium-stained amniotic fluid are about 100 times more likely to develop respiratory distress than those which are born through clear fluid.[2] Moreover the presence of meconium-stained amniotic is associated with a five-fold increase in perinatal mortality even in women who are at very low risk for obstetric complications. Aspiration can occur in uterowith fetal gasping or after birth with the first breaths of life. A large proportion of women with meconium stained liquor have risk factors simultaneously like preeclampsia, diabetes and post maturity.[3]

Globally, approximately 7-22% of all live births are complicated by meconium stained amniotic fluid. 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.[4] Death occurs in about 12% of infants with MAS.[5]

Meconium Aspiration Syndrome (MAS) is defined as a respiratory distress that develops shortly after birth, with radiographic evidence of aspiration pneumonitis and presence of meconium stained amniotic fluid.[6]

Meconium continues to be considered a soft marker of fetal distress, based on its historical role before modern perinatal management. 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.[7]

The risk factors for meconium stained amniotic fluid are both maternal and fetal. The maternal factors are hypertension, Gestational Diabetes mellitus, maternal chronic respiratory or cardiovascular diseases, post term pregnancy, preeclampsia, eclampsia. The fetal factors include oligohydramnios, intrauterine growth restriction, poor biophysical profile.[8]

The meconium aspiration syndrome can cause or contribute to neonatal death and in addition up to one-third of all cases in which aspiration occurs, develop long term respiratory compromise.

Remediable or preventable causes provide opportunities for intervention and planning.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.[7]

Materials and methods

This study is a prospective case control study of 100 subjects enrolled in a tertiary care hospital over a period of six months from May, 2018 to October 2018. Fifty patients with meconium stained amniotic fluid detected at any time during the course of labour or prior to it were enrolled in the study group if they fulfilled the inclusion criteria mentioned below and after obtaining an informed written consent.

Inclusion criteria for cases

Meconium stained liquor

Live fetus

Singleton pregnancy

Cephalic presentation

Primi or multigravida

Absence of major congenital anomalies

With or without medical risk factors

Exclusion criteria

Multiple gestation

Fetal Congenital anomaly

IUFD

For the control group, data of next woman giving birth following childbirth in the index patient, who satisfied the same set of inclusion criteria and had clear amniotic fluid was selected.

Data was collected using a standardized pretested proforma. Detailed history was taken to include maternal age, parity, gestational age, antenatal care, antepartum complications like hypertension in pregnancy, anaemia, fetal growth restriction, oligohydramnios, induction/augmentation of labour with oxytocin, prostaglandin E1, prostaglandin E2, premature rupture of membranes, dystocia, chorioamnionitis, fetal distress, cord problems, type of meconium, mode of delivery, birth weight of baby, APGAR scores at 1 and 5 minutes, development of meconium aspiration syndrome and neonatal death were recorded and analysed for risk factors of meconium, colour of meconium was graded following artificial rupture or spontaneous rupture

of membrane.

Labour was monitored for intra partum fetal heart rate abnormalities by continuous cardiotocography in cases, progression of labour, and mode of delivery.

After delivery, fetal wellbeing was assessed by APGAR scoring. New born was examined for cord around the neck, features of IUGR, congenital anomalies , post maturity and meconium staining of tissues.

Perinatal outcome was evaluated based on duration of NICU admission and development of complications such as meconium aspiration syndrome, respiratory distress, sepsis, persistent pulmonary hypertension of new born. New-born was followed up to discharge. Subject was followed for any morbidity including pyrexia, sepsis till discharge.

Statistical analysis of the study data was done with MS Excel (version 2016) and Open Epi software Comparison of proportions was done using chi-square test. Mean and standard deviations were calculated using standard methodologies.

Observation and Results

Table 1: Comparison of Demographic Charecteristics and antepartum risk factors between both the groups.

Parameters	Study group (n=50)	Control group (n=50)	p-value
Age in years			
<20(n=15)	8(16.0%)	7(14.0%)	
20-25(n=58)	28(56.0%)	30(60.0%)	0.980
25-30(n=21)	11(22.0%)	10(20.0%)	
>30(n=6)	3(6.0%)	3(6.0%)	
Mean age	23.4	23.4	
Antenatal care			
Booked(n=79)	37(74.0%)	42(84.0%)	0.22
Unbooked(n=21)	13(26.0%)	8(16.0%)	
GA at first ANC			
<12 weeks	5(10.0%)	4(8.0%)	
13-28 weeks	26(52.0%)	28(56.0%)	
28-32 weeks	3(6.0%)	5(10.0%)	>0.05
32-37 weeks	6(12.0%)	7(14.0%)	
37-42 weeks	10(20.0%)	6(12.0%)	
Number of ANC visits			
=3	15(30.0%)	18(36.0%)	
4-6	14(28.0%)	13(26.0%)	>0.05
=7	16(32.0%)	15(30.0%)	
No ANC	5(10.0%)	4(8.0%)	
Antepartum Risk factors			
Anemia	10(20.0%)	7(14.0%)	0.21
Oligohydramnios	7(14.0%)	5(10.0%)	0.27
Hypertension	5(10.0%)	1(2.0%)	0.04
IUGR	4(8.0%)	1(2.0%)	0.08
Prematurity	2(4.0%)	0(0%)	0.16

Most of the patients were in the age group of 21-30 years in both cases and controls. Overall no difference was observed in cases and controls, reflecting the usual age of childbearing in our country. The mean age of the subjects in present study was 23.4 years.

Five (10%) subjects were registered for antenatal care before 12 weeks gestation, while 19 (38%) were registered for antenatal care in the third trimester, 10(20%) of which were registered for antenatal care at term gestation, similar observation found in control group.(p value >0.05)

As mentioned in the table above 10% subjects had no ANC visit, 30% had 1 to 3 antenatal visits, while 32% had more than 7 antenatal visits in case group, similar observation found in control group. Antenatal registration would expect to result in identification of high risk factor if any and timely treatment to ensure an optimal pregnancy outcome. But this difference was not found statistically significant in our study. (p value >0.05)

The distribution of antenatal care status was similar in cases and controls, which was found non-significant in present study.

Five (10%) of the subjects with meconium stained amniotic fluid had been diagnosed with preeclampsia antenatally. Only 1 (2%) of the patients in the control group had preeclampsia. This difference was found to be statistically significant (p=0.04). Higher rate of pregnancy induced hypertension among meconium stained liquor patients was also noted in the studies by Khan et al (23) and Mundra et al.(24) Association with Anaemia, oligohydramnios and fetal growth restriction was not found to be statistically significant in our study though Naveen et al(18) identified fetal growth retardation as an independent risk factor for meconium stained amniotic fluid (p=0.01). The association with oligohydramnios and fetal growth restriction was less probably because many of our subjects had their antenatal ultrasonography done more than one month before their date of delivery. (Table 1)

Table 2: The intra-partum details of the cases and controls.

Parameters	Study group (n=50)	Control group (n=50)	p-value
Onset of labour (95*)			
Spontaneous(n=79)	35(77.8%)	46(92.0%)	
Augmented(n=5)	3(6.7%)	3(6.0%)	0.01
Induced (n=11)	7(15.6%)	1(2.0%)	

Table continous.....

Gestational age at delivery			
Preterm	2(4.0%)	2(4.0%)	
Term	46(92.0%)	47(94.0%)	>0.05
Post-term	2(4.0%)	1(2.0%)	
Mode of delivery			
Vaginal Delivery	12(24.0%)	46(92.0%)	<0.05
Caesarean section	35(70.0%)	3(6.0%)	<0.001
Instrumental delivery	3(6.0%)	1(2.0%)	>0.05
Intrapartum Factors			
Preterm premature rupture of membrane	2(4.0%)	0(0%)	
Associated prelabour rupture of membrane	5(10.0%)	0(0%)	0.024
Early rupture of membrane	29(58.0%)	2(4.0%)	<0.05
Artificial Rupture of Membrane	7(14.0%)	3(6.0%)	0.09
Protracted labour	1(2.0%)	0(0%)	–
Cord problems	2*(4.0%)	1(2.0%)	0.28
Chorioamnionitis	0(0%)	0(0%)	–
Abruption	0(0%)	0(0%)	–

A higher percentage of patients with induced labour pains had meconium stained amniotic fluid, (15.6% vs 2%) p>0.05.

In present study 4% of cases were found to be postdated as compared to 2% controls suggesting MSAF is more in postdated pregnancies but the difference was not statistically significant in our study (p value >0.05). Preterm deliveries accounted for only 4% in both groups.

Caesarean section was considerably higher in patients with meconium stained amniotic fluid (70% vs 6%), p=<0.001.

Overall ruptured membranes on admission (preterm premature rupture/prelabour rupture of membrane/Early rupture of membrane) was noted in 36 subjects (72%) of the study group, while overall ruptured membranes were noted in only 4% in the control group which was highly statistically significant (p<0.001) . This suggests the need for early referral of pregnant women with ruptured membranes to centres with facilities for caesarean section, neonatal resuscitation and NICU for optimal neonatal outcome. (Table 2)

Table 3 : The neonatal outcome according to various parameters.

Parameters	Study group (n=50)	Control group (n=50)	p-value
Birth weight			
<2.5kg	15(30.0%)	20(40.0%)	
2.5-3.0kg	22(44.0%)	22(44.0%)	
3-3.5kg	11(22.0%)	7(14.0%)	>0.05
>3.5kg	2(4.0%)	1(2.0%)	
Distribution as per appropriateness of growth			
SGA	11(22.0%)	1938.0%)	>0.05
AGA	39(78.0%)	31(62.0%)	
NICU admission			
Yes	19(38.0%)	2(4.0%)	<0.001
No	31(62.0%)	48(96.0%)	
Outcome			
Discharged	36(72.0%)	49(98.0%)	<0.001
Death	14(28.0%)	1(2.0%)	

The association of birth weight and passage of meconium was not significant in present study (p value >0.05). The distribution of cases and subjects with respect to appropriateness of growth with respect to gestational age at birth was not statistically significant in our study. (p value >0.05). The distribution of cases and subjects with respect to appropriateness of growth with respect to gestational age at birth was not statistically significant in our study. (p value >0.05)

The difference between number of babies needing NICU care in the two groups (cases 38% vs controls 4%) was highly statistically significant justifying the operationalisation of more NICUs at periphery, (p value <0.001). Mortality was 28% in cases and 2% of controls, which is statistically significant. 1 mortality in control group due to respiratory distress. (baby had 3 loop of cord around neck.) (Table 3)

Discussion

Meconium passage prior to birth occurs in up to 20% of term deliveries, meaning that the frequency of MSAF was one for every five deliveries, thereby making it a very common finding. But, in spite of it being so common, it can really disturb an obstetrician, as it is a very frequent cause of poor foetal outcomes and as it increases the number of neonatal intensive care unit admissions. In the study conducted by Naveen et al, maternal age >30 years was found to be a significant predictor for thick MSAF but maternal age was not associated with meconium stained amniotic fluid in present study.[9] Gestational age was found to be a significant factor with respect to meconium stained amniotic fluid in the studies conducted by Naveen et al.[9] In present study 4% of cases were found to be postdated as compared to 2% controls, Desai et al reported postdatism as having a significant correlation with MSAF (p value-0.015, CI 95%) which was not noted in our study. Pregnancy induced hypertension (PIH) was associated with

MSAF, but the incidence in our study was 10% (p=0.04), unlike the incidence of 13% in study of Khatun et al.[10] Association of PIH with MSAF is caused by an underlying utero placental insufficiency, which causes foetal hypoxia, resulting in meconium passage. Association with Anaemia, oligohydramnios and fetal growth restriction was not found to be statistically significant in our study. Sundaram et al.[7] reported that caesarean sections were performed twice as frequently in subjects with meconium stained amniotic fluid. In accordance with their study results, our study also showed nearly double caesarean section rates as compared to controls. The current study had a caesarean rate of around 70%. Such higher rates partly reflect the abnormal foetal heart rate patterns associated with MSAF and they partly reflect the obstetricians' dilemma in managing such labour, as at this time, they become more concerned about the foetuses and any minute alterations in normal labour patterns end up in caesarean sections. Naveen S et al.[9] also reported a caesarean section rate of 49.1% in MSAF. Overall ruptured membranes on admission (preterm premature rupture/ prelabour rupture of membrane/ Early rupture of membrane) was noted in 36 subjects (72%) of the study group, while overall ruptured membranes were noted in only 4% in the control group which was highly statistically significant (p<0.001). This suggests the need for early referral of pregnant women with ruptured membranes to centres with facilities for caesarean section, neonatal resuscitation and NICU for optimal neonatal outcome. The consistency of meconium has a direct correlation with foetal outcome. The risk of perinatal death is increased five to seven times when a thick meconium is present at the onset of labour. Infants with thin meconium are more likely to have passed meconium as a physiologic maturational process and they are more likely to be healthy at birth, however, they still require intensive foetal monitoring. In this study, 70% infants were asymptomatic at birth, 20% had low Apgar scores and 30% had meconium aspiration syndrome. The perinatal outcome was poor with MSAF, as was noted in this study, with NICU admissions of 21.21%. In our study, MAS was diagnosed in 30% babies who were born to MSAF, unlike 26% babies with MSAF in the study done by Sundaram et al.,[7] 12 (24%) babies in study group required ventilator support, whereas 1 (2%) babies in control group needed it (due to respiratory distress), which is statistically significant. (p value-<0.05) 11 out of 12 babies in study group who required ventilator belonged to thick MSAF. We noted a higher neonatal mortality in meconium stained liquor group (14 i.e. 28%) as compared to clear liquor group (1 i.e. 2%), which was statistically significant (p <0.001). Bhatia et al[4] and Khatun et al[10] reported a neonatal death rate of 9.2% and 2.9% respectively in their studies. There were 14 early neonatal deaths in study group, 4 due to aspiration pneumonia and 2 due to HIE, 4 due to infection or septicaemia and 4 due to RDS. Overall, the difference in baby weight and maturity at birth was not statistically significant in the two groups- cases vs controls, but difference in APGAR score at 1 min and 5 min, need for NICU admission, ventilatorysupport, duration of hospital stay and neonatal death was highly significant. MSAF babies in our study were associated with lower APGAR scores, more risk of birth asphyxia and meconium aspiration syndrome, more NICU admissions and hence more neonatal mortality.

Conclusion

Meconium stained amniotic fluid is worrisome from both obstetrician's and paediatrician's point of view, as it is associated with increased caesarean rates, birth asphyxia, MAS and neonatal intensive care unit admissions which were also noted in this study. Prediction of MSAF based on antenatal factors is not always possible, though pregnant women with prelabour or early labour rupture of membranes were noted to have a higher association with MSAF. Presence of MSAF noted before onset of labour and in early labour especially thick MSAF, necessitates intensive monitoring of labour including surveillance of fetal wellbeing, so as to optimise the neonatal outcome. Vigilance during labour for all women and timely referral to higher centre/ availability of trained staff for neonatal resuscitation and management is the key to reducing neonatal morbidity and mortality associated with MSAF.

References

1. Ahanya SN LJMBRM. Meconium passage in utero: mechanisms, consequences and management. Obstet Gynecol. 2005;: p. 60:45-56.
2. Fleischer A AAGDRGMI. A persistent clinical problem: profile of the term infant with significant respiratory complications. Obstet Gynecol. 1992;: p. 79:185-90.
3. Vaghela HP DKSP. Fetal outcome in deliveries with meconium stained liquor. Int J Reprod Contracept Obstet Gynecol. 2014;: p. 3:909-12.
4. Bhatia P EN. Fetal and neonatal outcome of babies in meconium stained amniotic fluid and meconium aspiration syndrome. J Obstet Gynecol India. 2007;: p. 57:501-4.
5. Cleary GM WT. Meconium-stained amniotic fluid and the meconium aspiration syndrome. Pediatr Clin North Am. 1998;: p. 45:511-29.

6. Klinger M C KJ. Meconium aspiration syndrome: pathophysiology and prevention. J Am Board Fam Med. 1999;: p. 12(6).
7. Sundaram R MA. Risk factors for meconium stained amniotic fluid and its implications. Int J Reprod Contracept Obstet Gynecol. 2016;: p. 5:2503-6.
8. Cheng YW HLLRJCA. Duration of the second stage of labor in multiparous women: maternal and neonatal outcomes. Am J Obstet Gynecol. 2007;: p. 196:585 e1–585.
9. Naveen S SVSR. Predictors of, possible, meconium stained amniotic fluid, strategy to reduce neonatal morbidity and mortality. J Obstet Gynecol India. 2006;: p. 56:514-7.
10. Khatun M AJHEKMMMKMea. Fetal outcome in deliveries with meconium stained liquor. Bangladesh J Child Healt. 2009;: p. 33:41-5.