

Association of meconium stained amniotic fluid with perinatal outcome in pregnant women of 37-42 weeks gestation

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Abstract

Objective: To determine the association of meconium stained amniotic fluid with perinatal outcome in pregnant women of 37-42 weeks gestation.

Study design: Cohort study.

Setting and duration: Department of Obstetrics and Gynecology, Liaquat National Hospital and Medical College, Karachi from January 20, 2010 to July 20, 2010.

Subjects and methods: Pregnant women of 37-42 weeks gestation with singleton pregnancy and cephalic presentation admitted in labour ward of

Liaquat National Hospital having clear or meconium stained amniotic fluid, were included in the study by non probability sampling. Outcome measures were fetal heart rate abnormality, mode of delivery, Apgar score, NICU admission and diagnosis of MAS.

Results: A total of 200 pregnant women were included in this study and divided into two equal groups. 50% with MAS fluid was labeled as exposed group 50% without MAS as unexposed group. The average gestational age was 38.74 ± 1.16 (95%CI: 38.57 to 38.89). Abnormal fetal heart rate was observed in 28% (56/200) cases. This was significantly higher in exposed group than unexposed group. Spontaneous delivery was observed in 121 (60.5%) cases, instrumental delivery in 26 (13%) and caesarean section was 53 (26.5%) cases. Caesarean section was done three times more in exposed group than unexposed group (RR=2.68, 95%CI: 1.13 to 3.48). Rate of unsatisfactory Apgar score was 8.5% (17/200). Rate of unsatisfactory Apgar score was 2 times higher in exposed group. (76.5% vs. 23.5%; $p=0.022$). (RR=1.609 95%CI: 1.19 to 2.18). Rate of meconium aspiration syndrome was 2% (4/200). NICU admission was observed in 21.1% (42/199) cases. Admission in NICU was not significant between groups (59.5% vs. 40.5%; $p=0.176$). Mortality was observed in 2.5% (5/200) and that was seen in exposed group. It was two times more in exposed group than unexposed groups (RR= 2.05; 95%CI: 1.78 to 2.37).

Conclusion: From our study we concluded that meconium stained amniotic fluid has an association with poor perinatal outcome and it is an indicator for negative fetal status. Results of our study are comparable to other international studies.

Keywords: Meconium stained amniotic fluid, Perinatal outcome, Meconium aspiration

Introduction:

The presence of meconium stained amniotic fluid (MSAF) is a serious sign of fetal compromise, which is associated with an increase in perinatal morbidity. MSAF was noted in approximately 12% of all deliveries. Meconium aspiration syndrome (MAS) was noted in 5% of these infants and more than 4% of MAS infants died account-

ing for 2% of all perinatal deaths.¹

Clear amniotic fluid on the other hand is considered reassuring. In earlier days, early amniotomy with active management of labour was done to detect meconium passed during labour. Amniotomy in labour is also commonly performed to detect meconium where fetal heart rate is un-

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satisfactory. If meconium stained amniotic fluid (MSAF) is found, then continuous fetal heart rate monitoring (Cardiotocography CTG) is required for fetal well being.^{2,3,4}

The exact etiology of MSAF remains unclear⁵. Previous studies have demonstrated that the incidence of MSAF rises with gestational age reaching as high as 30% in post term pregnancies. In utero, meconium passage rarely occurs before 32 weeks of gestation^{6,7} and most babies with meconium stained amniotic fluid are 37 weeks or older⁸.

MAS is more frequently seen in post term pregnancy or in growth restricted fetuses. An increased incidence of meconium passage into the amniotic cavity is also noted in the presence of fetomaternal stress factors such as hypoxia and infection, independent of fetal maturation⁹.

Factors such as placental insufficiency, maternal hypertension, pre-eclampsia, oligohydromnios or maternal drug abuse (tobacco or cocaine) also result in, in utero passage of meconium.¹⁰

Meconium itself may have potentially detrimental effects on fetal tissues and organs, although fetuses with meconium stained amniotic fluid are commonly born without any adverse sequelae. Among the adverse effects, meconium in the amniotic fluid has been suggested to stimulate umbilical vessel constriction, vessel necrosis, and production of thrombi, potentially associated with ischemic cerebral palsy. Meconium alters the level of zinc in amniotic fluid, which may reduce the antibacterial properties and possibly facilitate intra-amniotic infections. In the presence of fetal stress such as hypoxia, the gasping actions of the fetus may aspirate meconium into its lungs where meconium may neutralize the action of surfactant and promote lung tissue inflammation by activating neutrophils and macrophages.¹¹ In the presence of continued hypoxia after birth, aspirated meconium may contribute to pulmonary vascular hypertrophy and possibly pulmonary hypertension.

Meconium has been associated with additional

adverse events increased preterm labor, altered coagulation profile in the fetus, and neonatal seizures. Although the direct and indirect effects remain uncertain, meconium stained amniotic fluid is consistently identified as a predictor of maternal and perinatal complications.¹

The incidence of meconium stained amniotic fluid has remained approximately 12% since the last century. However, the incidence of MAS has decreased markedly during the past 20 years. Yoder et al.¹² reported a nearly 4-fold decrease in the incidence of MAS from 1990-1992 to 1997-1998, possibly as a result of early induction, liberal use of amnioinfusion, and increased caesarean section rate. Although there are recommended intrapartum and postpartum clinical strategies for the prevention of MAS,^{12,13} autopsy studies suggest that mostly meconium aspiration occurs in utero. Thus the prevention of fetal passage of meconium into amniotic fluid, understanding of the mechanism of clearance of meconium from the amniotic fluid and knowledge of the multiple factors contributing to MAS are essential to design therapeutic approaches for prevention of MAS.

The present study is undertaken in the representative sample from the urban population of Pakistan presented to a private tertiary care hospital of Karachi (Liaquat National Hospital). It will help to confirm the worldwide statistics in this population. It will also help in modification of obstetric decisions (like early induction of labour after 37 weeks gestation, caesarean or instrumental deliveries) in the light of the results. And also generalizing the modified procedures in sister organizations or elsewhere.

Material and methods:

This cohort study was conducted in Obstetrics & Gynaecology unit of Liaquat National Hospital, Karachi, from 20th Jan 2010 to 20th July 2010.

The inclusion criteria for this study was pregnant women of 18-40 years age with singleton pregnancy between 37-42 weeks gestation and cephalic presentation. Patients with antepartum haemorrhage, diabetes mellitus or hyperten-

sion were excluded from the study.

Study was carried out to determine the association of meconium stained amniotic fluid with perinatal outcome in pregnant women of 37-42 weeks gestation. All these women presenting at any stage of labour and meeting the selection criteria were selected by the on duty RMO (year 3 resident) and divided into two groups on the basis of presence or absence of meconium.

Group with meconium stained amniotic fluid was labeled as exposed while the other group with clear or meconium free amniotic fluid was labeled as unexposed. The purpose, procedure, risks and benefits of the study were explained to patients and consent obtained from patients by duty RMO. The course of labour was observed and any fetal heart rate abnormality detected by CTG, mode of delivery, Apgar score at 1 minute after birth was recorded on study proforma.

All neonates were seen by a Paediatric RMO. Presence or absence of meconium aspiration was confirmed by presence of meconium below the vocal cords on laryngoscopic examination of neonates born through meconium. In addition both mother and neonate were followed up during their stay in postnatal ward or neonatal ICU in case of admission for upto 1 week. All data was entered on proforma by the attending doctor.

Data was analysed using a statistical package for social sciences (SPSS Version 11). Data was entered into spreadsheet (Excel; Microsoft Inc, Redmond, WA) over the course of study. The quantitative variable gestational age was computed in mean and standard deviation and analyzed by independent student t test. The outcome variables were computed for frequency and percentage like fetal heart rate abnormality, mode of delivery, Apgar condition, meconium aspiration syndrome, NICU admission and mortality for exposed and unexposed groups and analyzed by chi-square test. Relative risks were also computed with 95% confidence interval. P values of more than .05 were considered not significant.

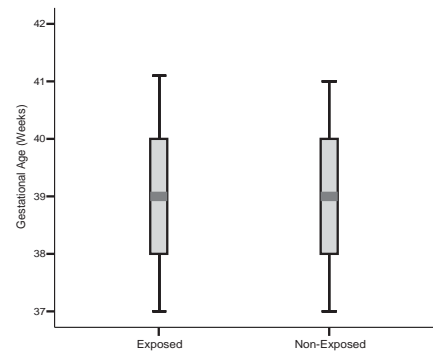
Results:

A total of 200 pregnant women of 37 to 42 weeks gestation with singleton pregnancy and cephalic presentation were included in this study. Women were divided into two groups. Hundred women with meconium stained amniotic fluid were labeled as exposed group while other women without meconium stained amniotic fluid were unexposed group. The average gestational age was 38.74 ± 1.16 (95%CI: 38.57 to 38.89). Significant difference was not observed between exposed and non-exposed groups in average gestational age (38.66 ± 1.16 vs. 38.8 ± 1.15 ; p 0.38) as presented in figure 1.

Abnormal fetal heart rate was observed in 28% (56/200) cases. Fetal heart rate abnormality was significantly higher in exposed group than unexposed groups. Risk of abnormal heart rate was two time higher in exposed group than non-exposed group (RR= 2.10; 95%CI: 1.65 to 2.68). Out of 200 women, spontaneous delivery was observed in 121(60.5%) cases, instrumental delivery was observed in 26(13%) and caesarean section was 53(26.5%) cases. Caesarean section was three times more in exposed group than unexposed group (RR=2.68, 95%CI: 1.13 to 3.48) as presented in table 1.

Rate of unsatisfactory Apgar score was 8.5% (17/200). Rate of unsatisfactory of Apgar score was significantly higher in exposed group than unexposed group (76.5% vs. 23.5%; p 0.022). Unsatisfactory score was two time more in ex-

Figure 1: Comparison of gestational age between groups



G. Age (weeks)	Exposed	Non-Exposed	P-Value
Mean \pm SD	38.66 ± 1.16	38.80 ± 1.15	0.38
Median (IQR)	39(2)	39(2)	

Table 1: Comparison of mode of delivery between exposed and non-exposed groups

Mode of Delivery	Exposed n=100	Non-Exposed N=100	Total n=200	RR (95%CI)
Spontaneous vaginal	40(33.1%)	81(66.9%)	121	1.00
Instrumental vaginal	13(50%)	13(50%)	26	1.51 (0.89 to 2.15)
Caesarean section	47(88.7%)	6(11.3%)	53	2.68 (1.13 to 3.48)

Chi-Square = 45.61 p= 0.0005

posed groups (RR=1.609 95%CI: 1.19 to 2.18).

Rate of meconium aspiration syndrome was 2% (4/200) while rate of meconium aspiration syndrome was also significantly high in exposed group than non-exposed group (100% vs. 0%; p=0.043). Meconium aspiration syndrome was two time more in exposed than non-exposed (RR=2.04; 95%CI: 1.77 to 2.35). NICU admission was observed in 21.1% (42/199) cases. Admission in NICU was not significant between groups (59.5% vs. 40.5%; p=0.176) as presented in figure 2

Discussion:

The detection of meconium stained amniotic fluid during labour often causes anxiety in delivery room because it is assumed as an indicator of fetal distress. Fetal condition during labour is usually assessed by measuring the fetal heart rate and checking the presence of meconium in the amniotic fluid.^{3,4} It is often assumed that an abnormal fetal heart rate, especially in the presence of meconium stained liquor, indicates hypoxia and acidosis, especially in the setup where facilities of cardiotocography and fetal scalp blood pH estimation are not available.²

The passage of meconium may be a normal physiological event reflecting fetal maturity. It may, on the other hand reflect fetal hypoxia or increased vagal activity from cord compression.¹ Although meconium is sterile its passage into amniotic fluid is important because of the risk of meconium aspiration syndrome (MAS) and its sequelae. The presence of meconium during labour is known to be associated with an increased risk of perinatal mortality and morbidity, despite the fact that the vast majority of infants born with MASAF showed neither short term nor long term impairments.

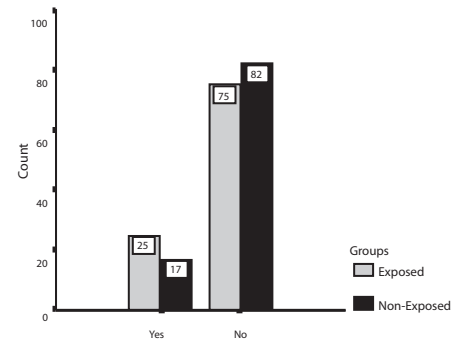


Figure 2: Comparison of NICU admission between exposed and non-exposed groups

The literature offers different views on short term perinatal outcome with MASAF. Most studies showing a link with low apgar score and decreased arterial cord pH values and some showing no correlation, studies also suggest that there are racial and socioeconomic differences in the risk of developing MAS.¹⁴

We conducted an observational cohort study to establish an association between MASAF and perinatal outcome in term pregnancies admitted in labour ward of Liaquat National Hospital Karachi for delivery including both booked and unbooked patients. Our sample represented the urban population of Pakistan. The hypothesis was that there is an association between MASAF and perinatal outcome. Our results however were similar to previous trials conducted in other developing countries like India that, there is an association between MASAF and perinatal outcome and it is a negative predictor of fetal wellbeing. On the contrary results from developed countries were different.

A retrospective cohort study conducted by Becker et al¹⁵ in low risk suburban population of Germany with the technical and logistic support of a modern obstetrical unit concluded that the presence of MASAF has only a very small effect on the immediate perinatal outcome. They recruited 1123 patients with the diagnosis of MASAF that fulfilled the inclusion and exclusion criteria. Inclusion criteria was singleton pregnancy, cephalic presentation, gestational age >36+6 weeks and trial of vaginal birth. Exclusion criteria were multiple gestation, non-cephalic presentation, primary c-section, severe

maternal disease, pre-eclampsia, fetal malformation and prematurity. For control group 1123 women who did not have MSAF and fulfilled the same set of inclusion and exclusion criteria were recruited. They analyzed a total of 2246 patients. Their results indicate that MSAF is more common in nulliparous women and its frequency increases with advanced gestational age. All forms of obstetrical interventions occurred more frequently in MSAF group. 31.3% of the MSAF infants underwent an operative delivery (caesarean/ operative vaginal) compared with only 15.8% of those in clear fluid group. No statistically significant difference was found in Apgar values and pH values among MSAF and clear fluid group.

Subgroups of infants delivered spontaneously versus those delivered by C-section were further analyzed to see whether the high obstetric intervention rate corresponds to a more depressed fetal status at birth, results indicate that both groups were similar with slightly better pH values and Apgar scores in the C-section group, concluding that C-section has a statistically significant protective effect independent of the presence of meconium.

A cross sectional study was conducted by Patil et al¹⁶ in India, to evaluate different management practices in meconium stained amniotic fluid and their effect on perinatal outcome. 249 women admitted to the labor ward with MSAF during the study period were recruited. Inclusion criteria were singleton pregnancy, and cephalic presentation. The exclusion criteria were antepartum hemorrhage, multifetal gestation and congenital fetal anomalies. Parameters studied included character of meconium, fetal heart rate abnormality, amnioinfusion, mode of delivery, Apgar score, birth weight, MAS, morbidity and mortality.

In our study a total of 200 pregnant women of 37 to 42 weeks gestation with singleton pregnancy and cephalic presentation were included. Sampling technique was non-probability purposive sampling. Women with Antepartum hemorrhage, Diabetes and Hypertension were

excluded from study. The study population was divided into two groups on the basis of color of liquor observed on spontaneous or artificial rupture of membranes. Hundred women with meconium stained amniotic fluid (MSAF) were labeled as exposed group while other women without meconium stained amniotic fluid (clear amniotic fluid CAF) were labeled as unexposed group. The study parameters included:

- Gestational age
- Fetal heart rate (CTG) abnormality
- Mode of delivery
- Apgar score at 1 min of birth
- NICU admission
- MAS

The average gestational age in exposed group was 38.66 ± 1.16 weeks while in unexposed it was 38.8 ± 1.15 weeks with a p-value <0.38 . Significant difference was not observed in average gestational age between exposed and unexposed groups in our study. While in the study by Becker et al the average gestational age in meconium group was 40.3 ± 1.0 weeks and in control group was 39.9 ± 1.1 weeks with a p-value <0.01 . Showing that frequency of meconium stained amniotic fluid increases with advanced gestational age. Wong SF et al⁸ conducted a trial on 9542 pregnant women in Princess Margaret Hospital, Hong kong. They found a strong association between incidence of meconium stained amniotic fluid and gestational age (average gestational age of MSAF group was 40 weeks Vs. 39 weeks with clear amniotic fluid p-value <0.0005). Naveen S et al⁹ conducted study on 1500 deliveries to identify predictors of MSAF in India, they also identified post dated pregnancy as one of the risk factors for MSAF (p-value <0.001). This difference was not observed in our study due to small sample size compared to other studies.

In our study the abnormal fetal heart rate was observed in 56 out of 200 cases, 45% of the patients in exposed group had abnormal fetal heart rate. On the other hand 11% of the unexposed group had abnormal fetal heart rate (p-value <0.0005). Risk of abnormal heart rate was two times higher in exposed group than unexposed group. Similarly in study by Patil et al abnormal

fetal heart rate was observed in 56% of the cases of MSAF, although the controls were not included in the study. In the study by Wong SF fetal distress (abnormal CTG) was found in 9.7% of MSAF Vs. 5.7% in clear amniotic fluid $P < 0.0005$. While in the study by Naveen S fetal distress was identified in 27.0% of MSAF and 8.5% of clear amniotic fluid. All these studies conclude the increased prevalence of CTG abnormalities in MSAF as compared to clear amniotic fluid which is in agreement with our results.

In our study Caesarean section was three times more in exposed group than unexposed group (RR=2.68, 95%CI: 1.13 to 3.48). 45% patients in exposed group had caesarean section which makes 88.7% of the total caesarean sections in the study. While only 6% patients in unexposed group had delivery by caesarean section which makes 11.3 % of the total caesareans. The difference was statistically significant with a p-value 0.0005.

In the study by Becker et al 17.4% of patients in meconium group had caesarean section compared to 9.6% in control group p-value < 0.01 . Similarly, in study by Wong SF 13.2% of MSAF Vs 8.8% of clear amniotic fluid had Caesarean section. This lower rate of C-section in meconium group may be due to scalp pH sampling which is not incorporated in our study as it is not available in our center.

In the study by Patil et al 42% of the patients with MSAF had caesarean section. While In study by Naveen S 49.1% of MSAF cases had caesarean section while 10.4% of clear amniotic fluid cases had caesarean section. These results are comparable to us as scalp pH sampling was not incorporated in their study. Low rate of caesarean section among clear fluid group in our study is due to exclusion of high risk pregnancies (Diabetes, Hypertension and Antepartum hemorrhage) from the study.

In our study a total of 17 babies had unsatisfactory Apgar score, 13% of exposed while 4% of unexposed group babies had unsatisfactory Apgar scores (p-value 0.022). Unsatisfactory score was

two time more likely in exposed group. In study by Becker et al no statistically relevant difference was noted in Apgar values of defined subgroups. Only 14 babies out of 2246 studied had unsatisfactory Apgar scores. 10 (0.9%) of them were in MSAF group and 4 (0.4%) in control group p-value 0.108. In study by Patil et al, 19% of babies with MSAF had unsatisfactory Apgar scores. In Wong SF 29% of MSAF Vs 19.4% of clear amniotic fluid had low 1 min Apgar scores. Both of these studies indicate high rate of unsatisfactory apgar score as in our study. Difference in Results may be due to better facilities to asses fetal well being in centers from developed world.

In our study MAS was diagnosed in 4% of babies in exposed group, in comparison to 12.8% babies born through MSAF in the study by Patil et al. All deliveries with MSAF in our study were attended by a paediatrician, who performed oropharyngeal and nasopharyngeal suctioning and laryngoscopy to determine meconium presence at or below the cords. In our study 5 perinatal deaths (2.5%) were observed. All were in exposed group. Mortality was two times more likely in exposed group than non-exposed group (RR= 2.05; 95%CI: 1.78 to 2.37). In study by Patil et al 10 perinatal deaths out of 249 cases (4%) were observed.

A large study published by Yoder et al¹² in 2002 evaluated the changes in obstetric practices associated with decreasing incidence of meconium aspiration syndrome. During the study period 2240 (17.3%) of 12,935 live births more than 37 weeks were exposed to MSAF. MAS was diagnosed in 61 (2.7%) there was no perinatal death caused by MAS. They also found that the incidence of MAS significantly decreased over the years of study from 1990 through 1998. Reduction in post term delivery was identified as the most important factor in reducing meconium aspiration syndrome.

Conclusion:

We concluded that meconium stained amniotic fluid has an association with poor perinatal outcome and it is an indicator of negative fetal status. Results of our study are comparable to other

international studies.

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