

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20163413>

Research Article

## Maternal and perinatal outcome in meconium stained amniotic fluid at term: a case control study

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**Received:** 19 January 2016

**Revised:** 10 September 2016

**Accepted:** 12 September 2016

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### ABSTRACT

**Background:** Fetal well-being has traditionally been evaluated on the basis of fetal activity, FHR and presence of meconium in liquor in vertex presentation. Passage of meconium is considered physiological sign of fetal maturity on one hand and a sign of fetal distress and response to hypoxic insult on the other hand.

**Methods:** Pregnant women of 37 - 42 weeks gestation with singleton pregnancy and cephalic presentation admitted in labour ward of Mahatma Gandhi Medical College and Research Institute with clear or meconium stained amniotic fluid following spontaneous rupture or ARM were included in the study. Outcome measures were fetal heart rate abnormality, mode of delivery, Apgar score, NICU admission and diagnosis of MAS.

**Results:** A total of 678 pregnant women were studied. Of them 226 had meconium stained and taken as study group. Rest 452 served as control group. The average gestational age of study group was 39.26±0.81. Abnormal FHR was observed in 56%. Spontaneous vaginal delivery was observed in 27.9% cases, instrumental delivery in 21.2% and caesarean section was 50.9% cases. Rate of low Apgar score 4.4% and it was two times higher in study group. NICU admission was observed in 46.7% cases of exposed group. Incidence of MAS in our study was 1.3%.

**Conclusions:** In low resource settings where fetal scalp pH, and umbilical cord lactate estimation facilities are not available, association of MSL with abnormal FHR can be taken as fetal distress and hence consideration of early operative intervention is necessary.

**Keywords:** Meconium stained liquor, Maternal outcome, Perinatal outcome

### INTRODUCTION

Fetal assessment and wellbeing has traditionally been evaluated on the basis of FHR patterns, fetal movements and colour of the amniotic fluid. Presence of meconium in the amniotic fluid has long been considered as ominous sign for fetal distress, although the exact cause is not known, passage of meconium is considered as physiological maturity of fetus.<sup>1,2</sup>

Meconium reduces the antibacterial property of amniotic fluid by altering the level of zinc in it which leads to intra amniotic infections. In case of hypoxia, gasping of fetus

results in meconium aspiration which neutralizes the surfactant action and promotes inflammation of lung tissues, whereas persistent hypoxia after birth, aspirated meconium results in pulmonary vascular and pulmonary hypertension.

Conflicting outcomes have been reported in the deliveries complicated by meconium staining, which differs with the degree of meconium staining.<sup>3</sup>

MSAF is one of the reasons for increase in operative deliveries.<sup>1</sup> The incidence of meconium staining has remained approximately 12% since last century. Yoder

reported a nearly 4 fold decrease in MAS incidence from 1990-1992 to 1997-1998, as a result of early induction of labour, early amniotomy, use of amnioinfusion in some cases and increased caesarean section rate. Presence of meconium below the vocal cord is known as meconium aspiration syndrome.<sup>4</sup> As per previous studies, only 5% of neonates born through meconium stained amniotic fluid develop MAS.<sup>4</sup>

Many studies suggest that MSAF is low risk obstetrical hazard because the perinatal mortality rate attributable to meconium was 1 death per 1000 live birth. Many researchers have disregarded the importance of MSAF as an indicator of fetal distress. However a significant association has been reported between the consistency of meconium and abnormal FHR patterns, increased rate of caesarean section and low Apgar scores.<sup>1,5</sup>

Although the direct and indirect effects of meconium staining remain uncertain, MSAF is considered as a predictor of maternal and perinatal morbidity and mortality.<sup>2</sup> The present study was carried out to find out the maternal and perinatal outcome associated with meconium stained liquor in our institution.

The objectives of the study was to estimate the prevalence and mode of delivery and maternal and perinatal morbidity associated with meconium stained amniotic fluid at term.

**METHODS**

The present study was conducted in Mahatma Gandhi Medical College and Research Institute Hospital, Pondicherry, a rural tertiary care centre between November 2013 - April 2015. During this study period patient who had MSL on spontaneous or artificial rupture of membrane comprised the study group and those with clear liquor comprised control group. Cases with meconium stained liquor was graded as thick and thin MSL. Pregnant women with MSL were monitored continuously with CTG.

- “Thick” if the fluid is, dark green in colour, viscous, tenacious and containing large amount of particulate material
- “Thin” if the fluid is lightly stained without particulate material

Intrapartum cardiotocographic tracing also taken for assessing fetal hypoxia during labour where in the present study bradycardia was considered when fetal heart rate below 110 bpm and tachycardia when fetal heart rate above 160 bpm. Apgar score of the newborn was assessed at 1 minute. Babies were considered non-asphyxiated and good condition when Apgar score was 7 or more. Babies were considered moderately asphyxiated when score was between 4 to 6 and was considered grossly asphyxiated when score was below 4. Resuscitation was considered according to need

determined by Apgar scoring in consultation with neonatologist.

**Follow-up of the newborn**

Babies with Apgar >6 placed with the mother. Babies with Apgar <5 were transferred to NICU for observation. Babies who developed any sign of complications within 24 hours were kept in NICU.

**Sample size**

This study comprised a sample size of 226 pregnant women which was calculated from

$n = 4 pq/12$  considering prevalence of meconium stained liquor as 18% from previous literature, allowable error as 5% and confidence interval as 95%. To prevent measurement error control group were taken as 1:2 ratio and comprised of 452 pregnant women.

**Study parameters**

- Maternal age
- Parity
- Gestational age
- Onset of labour
- Mode of delivery
- Grading of MSL
- FHR pattern
- Apgar score
- Length of NICU stay.

**RESULTS**

This case control study was conducted in the department of obstetrics and gynaecology, MGMCRI, Puducherry from January 2014 to July 2015. During this period pregnant women in labour who presented with meconium staining of amniotic fluid were compared with those with clear liquor.

Total numbers of deliveries during the study period of 18 months were 3420. Of which 810 cases had meconium staining of amniotic fluid, which constituted to 23.6% of total deliveries (Table 1). Of these, only 226 cases that fulfilled the inclusion criteria were considered for study.

**Table 1: Incidence of meconium stained amniotic fluid cases.**

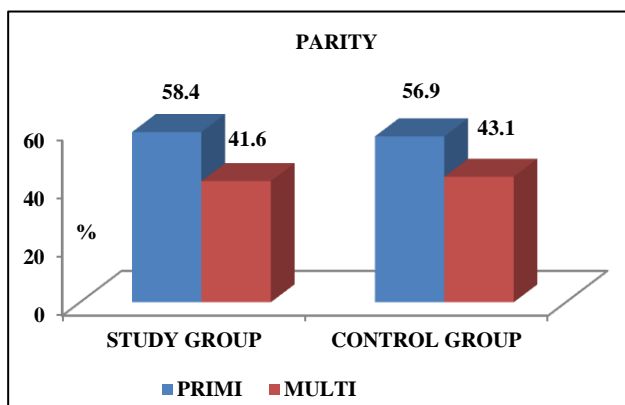
No. of deliveries during the period of study (n)	No. of meconium stained cases	Percentage of meconium stained cases (%)
3420	810	23.6

In this study, 27% of deliveries had thin MSL and 63% cases had thick MSL (Table 2).

**Table 2: Type of meconium stained amniotic fluid in study group.**

Amniotic fluid	No of cases N = 226	Percentage
Thin MSL	183	27%
Thick MSL	43	63%

There were no significant differences of gravidity in between meconium stained group and control group. In meconium stained group primigravida were 58.4% and in control group it was 57.4% cases (Figure 1).



**Figure 1: Parity distribution.**

This table shows that post-dated cases are more (9%) in meconium stained group compared to control group. Signifying that meconium passage is common occurrence in post-dated pregnancy. Mean gestational age in both study and control groups were also similar (Table 3).

**Table 3: Gestational age.**

Gestational age (in weeks)	Study N = 226		Control N = 452	
38	65	28.8	135	29.5
39-40	159	70.4	317	70.1
41-42	2	9	0	0
Mean±SD	39.26±0.81		39.2±0.73	

P value = 0.13.

This table shows 47.8% cases had spontaneous labour in meconium staining group, whereas in control group it was 52.9% (Table 4).

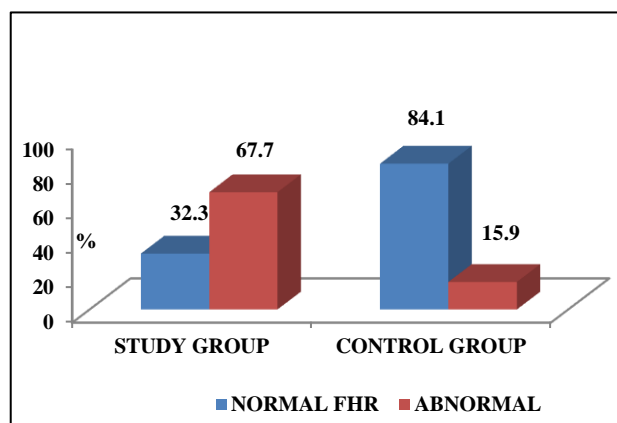
**Table 4: Onset of labour.**

Onset of labour	Study		Control	
	n = 226	%	n = 452	%
Induced	118	52.2	213	47.1
Spontaneous	108	47.8	239	52.9

P = 0.45.

Abnormal FHR was seen in 67.7% of new-borns in the study group but in the control group only 15.9% of the new-borns had abnormal FHR. This difference of NST

reactivity was statistically significant with P = 0.000 (Figure 2).



**Figure 2: FHR pattern.**

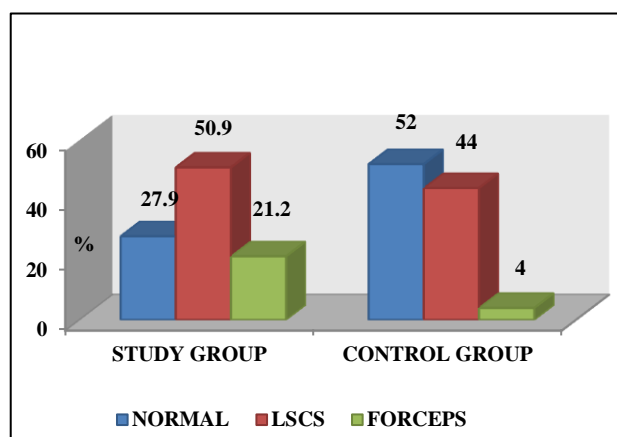
Thin meconium stained liquor was associated with 72.1% of abnormal FHR and thick meconium stained liquor was associated with 48.8% abnormal FHR patterns whereas in the presence of meconium, normal FHR was noted in 27.9% cases of thin MSL and 51.2% cases in thick MS (Table 5).

**Table 5: FHR and grading of meconium.**

FHR	Thin MSL		Thick MSL	
	No of cases	%	No of cases	%
Normal FHR	51	27.9	22	51.2
Abnormal FHR	132	72.1	21	48.8

P=0.000.

Incidence of CS was highest in study group (50.9%), whereas 44% in control group which was statistically significant (Figure 3).



**Figure 3: Mode of delivery.**

This table shows that mode of delivery vary according to grading of meconium staining in study group. Incidence of CS was highest in thick group (67.4%) compared to

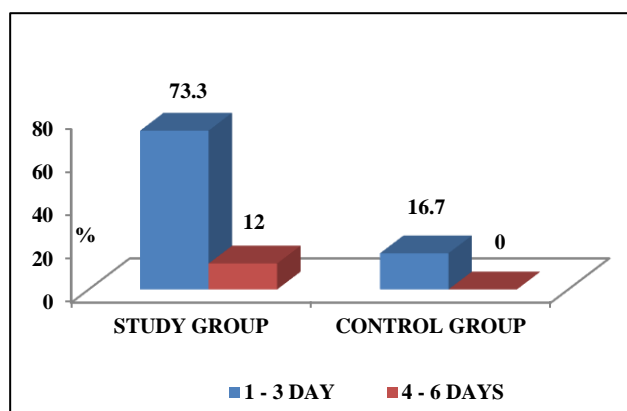
47% in thin group whereas forceps deliveries were more in thin group (21.3%) than thick group (20.9%) (Table 6).

**Table 6: Mode of delivery in MSL grading.**

Mode of delivery	Thick MSL		Thin MSL	
	No. of cases	%	No. of cases	%
Normal	5	11.6	58	31.7
LSCS	29	67.4	86	47
Forceps	9	20.9	39	21.3

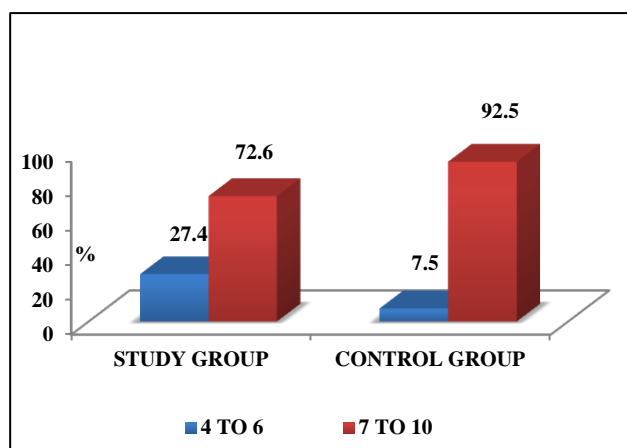
P=0.000.

This table shows that 73.3% of cases of study group required NICU care of which thick meconium group about twice than that of thin meconium group. Only 16.7% of cases of control group were required NICU care (Figure 4).



**Figure 4: NICU admission.**

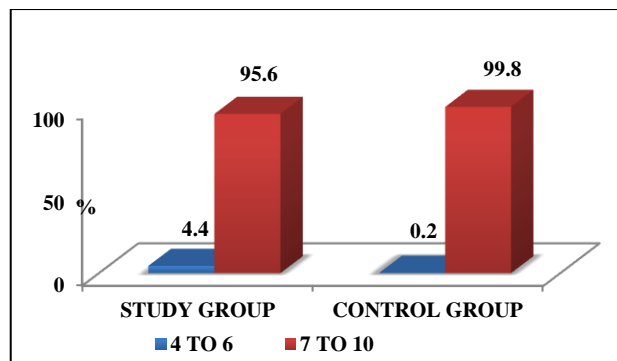
Apgar score was <7 at 1 minute in 27.4% meconium stained group babies as compared to 7.5% babies in control group which was significant (Figure 5).



t = 0.11; df = 676; P = 0.000.

**Figure 5: Apgar score at 1 minute.**

Apgar score was <7 at 5 minute in 10(4.4%) babies of study group as compared to 2% babies of control group (Figure 6).



t = 0.75; df = 314; P = 0.000

**Figure 6: Apgar score at 5 minute.**

In this study, 5.6% of thin meconium stained group babies were moderately asphyxiated at 1 minute whereas 3.5% babies were moderately asphyxiated in thick meconium stained group (Table 7).

**Table 7: Apgar score at 1 minute in MSAF grading.**

1 minute	Thin MSL		Thick MSL	
	No. of cases	%	No. of cases	%
<7	38	5.6	24	3.5
≥7	145	21.4	19	2.8

P = 0.000.

This table shows that 1.3% of babies in thick meconium stained group were moderately asphyxiated whereas 1% of babies in thin meconium stained group were moderately asphyxiated at 5 minutes (Table 8).

**Table 8: Apgar score at 5 minute in MSL grading.**

5 minutes	Thin MSL		Thick MSL	
	No. of cases	%	No of cases	%
<7	1	0.1	9	1.3
≥7	152	26.5	34	5

P = 0.000.

**Meconium aspiration syndrome**

In this study, incidence of MAS was 1.3% (3) which was statistically significant p = 0.000.

**DISCUSSION**

Meconium stained amniotic fluid has been implicated as a fetal wellbeing during the intrapartum and postpartum periods. Presence of meconium in amniotic fluid in cephalic presentation was of greater concern even to midwives of old age. Whereas detection of meconium in breech presentation is insignificant as it was due to mechanical compression of fetal abdomen.

Presence of meconium in the amniotic fluid during labour often causes anxiety in delivery room because it is assumed as an indicator of poor fetal outcome. Fetal status

during labour is usually assessed by measuring the fetal heart rate abnormalities and checking the colour of the amniotic fluid. It is often assumed that fetal heart rate abnormalities, especially in the presence of meconium stained liquor which indicates hypoxia and acidosis.<sup>7</sup>

Passage of meconium may be a normal physiological event reflecting fetal maturity. It also reflects fetal hypoxia or increased vagal activity from cord compression. The presence of meconium during labour is associated with an increased risk of perinatal mortality and morbidity. Most workers showed there is an association with fetal heart rate abnormalities, low Apgar scores and low arterial cord PH in the presence of meconium stained amniotic fluid.<sup>1</sup>

The present study was undertaken to evaluate the significance of meconium stained amniotic fluid and its fetal outcome in parturients admitted to Mahatma Gandhi Medical College and Research Institute between January 2014 to June 2015.

Out of 3420 deliveries conducted in our hospital during this period 678 cases were included in our study which fulfilled the inclusion criteria.

### **Incidence**

As compared to others study incidence in the present study was higher. This may be attributed to more use of misoprostol as labour inducing agent (Table 9).

### **Grading of MSAF**

In present study, among the study group, highest incidence was thin meconium compared to thick meconium stained amniotic fluid.

Out of 226 deliveries of our study period 27% cases had thin MSL and 6.3% of cases had thick MSL (Table 10).

Many authors found that incidence of thin MSL were high compared to thick MSL, which is comparable to our present study.

### **Maternal age**

In the present study, maternal age found to be similar in study and control group whereas no other study commented about it.

### **Gestational age**

Becker et al concluded from his work that frequency of meconium stained amniotic fluid is increases with advanced gestational age but in our study mean gestational age is 39 weeks in both study and control groups.<sup>28</sup>

From Table 4, it is evident that 9% of mother in study group fall into the category of postdated pregnancy in comparison with control group. This proves that meconium passage is a common occurrence in post-dated pregnancy. Similar observation was also recorded by Miller where the incidence of postdated pregnancy was 30%<sup>15</sup>. In present studies it was 9%. Mean gestational age was higher (39.8 weeks) in study group than control group (38.8weeks), whereas Rosario found mean gestational in study group was 39.6 weeks in comparison to control group (39.9 weeks).<sup>20</sup>

### **MSAF and abnormal FHR**

In present study, abnormal FHR was found in 32.3 % of study group and of 15.9% of control group.

Salma et al, from his work, found that non-reactive NST was observed in 28% cases of meconium stained cases compared to control group similarly, study by Patil et al showed that FHR abnormalities was seen in 56% of cases with MSAF.<sup>27,31</sup> In present study, abnormal FHR was 32.3% of study group and 15.9% of control group.

Another study by Wong also evident that abnormal FHR was found in 9.4% cases of MSAF, while in the study by Naveen observed that 27% of cases of MSAF presented with fetal distress. All these results from various studies conclude that CTG abnormalities in MSAF as compared to control group which is similar to results of present study.<sup>32</sup>

### **Mode of delivery**

In present study incidence of CS was highest in thick MSL, that was 67.4% and out of 226 total meconium stained amniotic fluid cases 50% delivered by caesarean section whereas in control group it was 44% (Figure 3).

In comparison to thin MSL group incidence of caesarean section was near about double in thick MSL.

In comparison to thin MSL group incidence of caesarean section was near about double in thick MSL.

The main indication of CS in our study group was due to fetal distress detected by MSL associated with abnormal FHR.

### **Parity**

From this study, meconium stained amniotic fluid is more commonly associated in primipara and results of this study are comparable with other studies (Table 12).

### **APGAR score**

Surekha et al observed low Apgar score at 1 and 5 minutes and results were found statistically significant

whereas Becker, from his study found there was no statistically significant difference in low Apgar scores.<sup>28</sup>

Low Apgar score in MSAF may be because of direct vasoconstrictor effect of meconium on umbilical vein that results in vasospasm leading to impaired placental blood flow.

In study group 72.6% babies had Apgar score 7-10 at 1 minute and 27.4% babies had Apgar score of less than 6 in 1 minute while in control group 92.5% of cases had Apgar score of 7-10 at 1 minute and 7 % cases had less than 7 (Figure 5).

In our study, 5 minutes Apgar score >7 was in 95.6% in study group compared to control group of 99.8% (Figure 6).

Only 4% babies had Apgar score less than 6 at 5 minutes in study group (Figure 6).

### **NICU care**

Present study showed that NICU care needed more in MSAF group babies than that of control group. Other study by Goud et al also observed 54% of MSG babies required NICU care.<sup>5</sup>

Out of major complications among deliveries through MSAF, birth asphyxia was commonest complication.

Limitations of this study evident of fetal distress was not confirmed with fetal scalp PH or umbilical cord lactate.

### **CONCLUSION**

The overall incidence of meconium staining of amniotic fluid during labour in our study was found to be 23.6%. The incidence of meconium stained amniotic fluid was much greater in induced labour and post-dated pregnancy.

Abnormal FHR was much more frequent in study group. Thick meconium was associated with low Apgar score and meconium aspiration.

Operative interference was higher in pregnancy associated with MSL compared to control group.

1 min and 5 min Apgar score was much lower in the pregnancy associated with MSL compared to control group and meconium staining of amniotic fluid had definitive predictive value regarding low Apgar score and hence fetal outcome. NICU admission was higher in pregnancy associated with MSL compared to control group.

Incidence of MAS in our study was 1.3%.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Samiyappa DP, Ghose S, John LB, Samal R. Maternal and perinatal outcome in meconium stained amniotic fluid at term: a case control study. *Int J Reprod Contracept Obstet Gynecol* 2016;5:3404-10.