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Original Research Article

A Case Control Study to Assess Perinatal Outcome and Mode of Delivery in Meconium Stained Liquor

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Abstract

Background: Prevalence of meconium-stained liquor (MSL) is 12-16% of all the deliveries.1-3 .Detection of MSL is associated with abnormal fetal heart rate (FHR), so once the MSL is detected, continuous FHR monitoring is needed as is associated with abnormal foetal outcome. MSL is associated with both maternal and foetal risk factors. Maternal factors include hypertension, gestational diabetes mellitus, maternal chronic respiratory or cardiovascular diseases, post term pregnancy, pre- eclampsia and eclampsia. Foetal factors include oligohydramnios, foetal growth restriction and poor bio physical profile.

AIM: To assess perinatal outcome and mode of delivery in MSL.

Materials & Method: Study Site: Department of Obstetrics and Gynecology, Sanjay Gandhi Memorial Hospital, Delhi. Study design is Hospital based case control study. Study duration was December 2019 to June 2021, and Study papulation was all pregnant women booked or unbooked who comes to labor room obstetrics and gynaecology department of Sanjay Gandhi memorial hospital, Delhi.

Result: Caesarean section was commonly done in Cases group compared to Control group (49.6% vs. 26.4%) while spontaneous vaginal delivery was commonly done in Control group compared to Cases group (38.8% vs. 70.4%) 199 (79.6%) neonates in the Cases group were asymptomatic at birth compared to 232 (92.8%) neonates in the Control group. Incidence of meconium aspiration syndrome (2.8% vs. 0.8%), neonatal sepsis (2% vs. 1.2%), and Hypoxemic ischemic encephalopathy (1.2% vs. 0.8%) was comparable between the groups while the incidence of birth asphyxia was significantly higher in Cases Group compared to Control Group

Conclusion: Till such time that better strategies for management of meconium-stained neonates are outlined the best course would be careful intrapartum fetal heart rate monitoring and timely detection of fetal asphyxia. Meconium-stained amniotic fluid and the adverse neonatal outcome are associated with high-risk pregnancy like PIH and oligohydramnios, therefore, MSAF can be prevented with early screening, prompt recognition, quick and proper management. The presence of thick meconium needs close monitoring as it is associated with decreased APGAR score and increased NICU stay that's why early and timely obstetrical intervention and appropriate neonatal care, to minimize meconium related complications and improve fetal outcome.

Keywords: Meconium-Stained Liquor; oligohydramnios; PIH; APGAR score; fetal outcome.

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Introduction

Meconium in Greek means Opium or Poppy-like substances, which leads to increased sleepiness of foetus in mother's womb. Prevalence of meconium-stained liquor (MSL) is 12-16% of all the deliveries [1-3]. In utero passage of meconium may simply represent the normal gastrointestinal maturation or may indicate an acute or chronic hypoxic event, thereby making it a warning sign of foetal compromise [4]. Meconium in utero is associated with a poor perinatal outcome such as low Apgar score, chorioamnionitis, increased rate of Neonatal intensive care unit (NICU) admission and perinatal death [5]. Even though the meconium appears very early in the foetal intestine in utero, it is not seen in amniotic fluid before 38 weeks of gestation age [6]. Detection of MSL is associated with abnormal fetal heart rate (FHR), so once the MSL is detected, continuous FHR monitoring is needed as is associated with abnormal foetal outcome. Meconium aspiration into the neonatal lungs, is

associated with clinical entities ranging from respiratory distress to severe respiratory compromise thus leading to significant increase in perinatal morbidity and mortality [7]. MSL is associated with both maternal and foetal risk factors. Maternal factors include hypertension, gestational diabetes mellitus, maternal chronic respiratory or cardiovascular diseases, post term pregnancy, pre-eclampsia and eclampsia. Foetal factors include oligohydramnios, foetal growth restriction and poor bio physical profile [8].

MSL is associated with increased risk of operative interference in terms of instrumental delivery or caesarean section and increased rate of neonatal resuscitation and meconium aspiration syndrome (MAS) [9]. Approximately 10% of all the pregnancies have MSL, out of which 5% i.e., 1 in 200 cases goes for meconium aspiration into lungs of foetus or neonate leading to severe respiratory distress and meconium aspiration syndrome (MAS) [10]. Perinatal morbidity and mortality associated with MSL can be decreased by identifying the high-risk factors in antenatal period and careful decisions are made about the timing and mode of delivery and vigilant monitoring of the labour [11]. This study was carried out to know the correlation of MSL with perinatal outcome and mode of delivery.

Aim: To assess perinatal outcome and mode of delivery in MSL.

Materials and Methods

Methods: This was a case control study conducted with 500 patients to the assess perinatal outcome, mode of delivery, and correlation of high-risk factor in Meconium-Stained Liquor (MSL). It included both booked & unbooked, high risk & low risk patients admitted in the labor room in early or established labor were selected. Mode of delivery was decided as per obstetric and fetal conditions which were either vaginal, instrumental, or caesarean. The perinatal outcome was assessed by Fetal weight, APGAR score at 1 min, 5 min, status of the baby whether shifted to mother side or NICU/nursery admission. IF admitted in NICU/nursery then baby was followed throughout till discharge.

The high-risk factors included are Anaemia, Pregnancy induced hypertension, intrauterine growth restriction, Oligohydramnios, Gestational diabetes mellitus. The patients were divided into following two groups: Cases: 250 patients with meconium-stained amniotic fluid (MSAF).

Control: 250 patients with clear liquor.

Inclusion Criteria:

All pregnant women with gestational age ≥37 weeks to 42 weeks with

1. Meconium-stained amniotic fluid
2. Singleton pregnancy
3. Cephalic presentation.

Exclusion Criteria:

1. Gestational age ≤ 37 week
2. Multiple pregnancy
3. Non cephalic presentation(breech, transverse and compound presentation)
4. Any known congenital anamalies.

Statistical Analysis: Statistical Analysis was performed with the help of Mean and Standard deviation. Comparison among the study groups is done with the help of unpaired t-test as per results of the normality test. Qualitative data are presented with the help of a frequency and percentage table. Association among the study groups is assessed with the help of Fisher test, student „t" test and Chi-Square test. „p" value less than 0.05 is taken as significant.

Results

1. The majority of the patients (58.8%) in Cases were in the age group of 21-30 years followed by 22.8% in the age group of >30 years and 18.4% in the age group of 18-20 years. The mean age in Cases was 26.42 ± 5.28 years. The majority of the patients (60.8%) in Control were in the age group of 21-30 years followed by 25.2% in the age group of >30 years and 14% in the age group of 18-20 years. The mean age in Control was 26.74 ± 5.14years.
2. 72 (28.8%) patients in Cases were booked cases while 178 (71.2%) patients were unbooked. 84 (33.6%) patients in Control were booked cases while 166 (66.4%) patients were unbooked.
3. 116 (46.4%) and 134 (53.6%) patients in Cases were primigravidas and multigravida respectively while 103 (41.2%) and 147 (58.8%) patients in Control were primigravidas and multigravida respectively.
4. The majority of the patients in Cases and Control presented between 39-41 weeks of gestation (53.2% and 76.8% respectively) followed by >41 weeks (36% and 11.6% respectively) and 37-38 weeks (10.8% and 11.6% respectively). The mean gestational age of patients in Cases and Control was 40.58 ± 1.68 weeks and 39.52 ± 1.35 weeks respectively.
5. Incidence of severe anaemia (6.8% vs. 4.4%; p>0.05), premature rupture of membranes (12.4% vs. 14.4%; p>0.05), FGR (4.4% vs. 3.2%; p>0.05) and GDM (2% vs.2.8%; p>0.05) was comparable in patients of Cases and Control group as per ChiSquare test. Pregnancies complicated with pregnancy induced hypertension (PIH) were significantly higher in Cases (16.8%) as compared to Control (7.2%) as per the Chi-Square test (p<0.05). The incidence of oligohydramnios was significantly higher in Cases compared to Controls as per Chi-Square

test (17.6% vs. 1.6%; p<0.05).

6. Caesarean section was commonly done in Cases group compared to Control group (49.6% vs. 26.4%) while spontaneous vaginal delivery was commonly done in Control group compared to Cases group (38.8% vs. 70.4%) and this difference was statistically significant as per Chi-Square test (p<0.05). 29 (11.6%) and 8 (3.2%) patients in the Cases and Control group respectively underwent instrumental deliveries and this difference was comparable as the per Chi-Square test (p>0.05).
7. 199 (79.6%) neonates in the Cases group were asymptomatic at birth compared to 232 (92.8%) neonates in the Control group and this difference was statistically significant as per the Chi-Square test (p<0.05). Incidence of meconium aspiration syndrome (2.8% vs. 0.8%), neonatal sepsis (2% vs. 1.2%), and Hypoxemic ischaemic encephalopathy (1.2% vs. 0.8%) was comparable between the groups while the incidence of birth asphyxia was significantly higher in Cases Group compared to Control Group as per Chi-Square test (14.4% vs. 4.4%; p<0.05).
8. The mean APGAR score at 1 min was significantly lower in Cases Group compared to Control Group as per the student t-test (7.82±2.02 vs. 8.07±1.56; p<0.05) while the mean APGAR score at 5 mins was comparable between the groups as per Student ttest (8.10±1.66 vs. 8.16±1.43; p>0.05).
9. 33 (13.2%) and 11 (4.4%) neonates in the Cases and Control group respectively required NICU admission. The incidence of NICU admissions were significantly higher in the Cases Group compared to the Control Group as per the Chi-Square test (p<0.05).
10. The mean NICU stay of neonates in Cases were significantly higher compared to Control as per the student t-test (6.42±2.87 days vs. 22.36±8.60 days; p<0.05). Similarly, the hospital stay of these neonates in the Cases were significantly higher compared to the Control as per the student t-test (22.36±8.60 days vs. 8.45±4.55 days; p<0.05).
11. 170 (68%) and 210 (84%) patients in the Cases and Control group respectively had reactive NST. The incidence of fetal distress was significantly higher in Cases compared to Control as per the Chi-Square test (p<0.05).
12. 21 (8.4%) and 7 (2.8%) neonates in the Cases and Control Group died in our study. There was no significant difference between the groups as per Chi-Square test (p>0.05).
13. There was the significantly higher number of patients with Grade 2 MSL (40.2%) and Grade 3 MSL (71.4%) that underwent Caesarean section as compared to patients with Grade 1 MSL (25.9%) as per the Chi-Square test (p<0.05).
14. The mean APGAR Score at 1 min of neonates was significantly higher in patients with Grade 1 MSL (8.08±1.76) and Grade 2 MSL (7.81±1.95) compared to patients with Grade 3 MSL (7.65±2.28) as per ANOVA test (p<0.05). The mean APGAR Score at 5 mins of neonates was significantly higher in patients with Grade 1 MSL (8.19±1.39) and Grade 2 MSL (8.20±1.69) compared to patients with Grade 3 MSL (7.92±1.81) as per ANOVA test (p<0.05).

Table 1 : Distribution of patients according to Gestational Age

Gestational Age	Cases (N)	Cases (%)	Control (N)	Control (%)
37–38 weeks	27	10.8%	29	11.6%
39–41 weeks	133	53.2%	192	76.8%
>41 weeks	90	36.0%	29	11.6%
Total	250	100%	250	100%
Mean ± SD	40.58 ± 1.68	—	39.52 ± 1.35	—

Table 2: Distribution of patients in Cases Group according to MSL Grading

MSL Grading	Cases (N)	Cases (%)
Grade 1	85	34.0%
Grade 2	102	40.8%
Grade 3	63	25.2%
Total	**250**	**100%**

Table 3: Distribution of patients according to Antepartum and intrapartum factors

Antepartum and Intrapartum Factors	Cases N	Cases (%)	Control N	Control (%)	p-value
Anaemia	17	6.8%	11	4.4%	>0.05
Pregnancy-induced hypertension	42	16.8%	18	7.2%	**<0.05**
Prelabour rupture of membrane	31	12.4%	36	14.4%	>0.05
Oligohydramnios	44	17.6%	4	1.6%	**<0.05**
FGR	11	4.4%	8	3.2%	>0.05
GDM	5	2.0%	7	2.8%	>0.05

Discussion

In the present study, the majority of the patients (58.8%) in Cases were in the age group of 21-30 years followed by 22.8% in the age group of >30 years and 18.4% in the age group of 18-20 years. The mean age in Cases was 26.42 ± 5.28 years. The majority of the patients (60.8%) in Control were in the age group of 21-30 years followed by 25.2% in the age group of >30 years and 14% in the age group of 18-20 years. The mean age in Control was 26.74 ± 5.14years. This is similar to the study of Mundhra R et al` [12] prospective observational study evaluating the fetal outcome in Meconium-Stained Amniotic Fluid found 65.45% women were of 20-30years age-group.

It was observed in the present study that 72 (28.8%) patients in Cases were booked cases while 178 (71.2%) patients were unbooked. 84 (33.6%) patients in Control were booked cases while 166 (66.4%) patients were unbooked. 116 (46.4%) and 134 (53.6%) patients in Cases were primigravida and multigravida respectively while 103 (41.2%) and 147 (58.8%) patients in Control were primigravida and multigravida respectively. This is comparable to the study of Patel S et al [16].

Patel S et al [16] prospective observational study observed a total of 82 cases of grade I MSL out of which 26 were primigravida, 40 patients were multipara and 16 had history of previous caesarean section (CS). Similarly, out of 63 grade II MSL cases 51 were primipara, 2 were multipara and 10 had previous CS. MSL as well as MAS has been strongly associated with the parity of the mother.

It was observed in our study that the majority of the patients in Cases and Control presented between 39-41weeks of gestation (53.2% and 76.8% respectively) followed by >41 weeks (36% and 11.6% respectively) and 37-38 weeks (10.8% and 11.6% respectively). The mean gestational age of patients in Cases and Control was 40.58 ± 1.68 weeks and 39.52 ± 1.35 weeks respectively. Thobbi VA et al [17] noted similar observations in the study. Thobbi VA et al [17] prospective observational study found maximum cases were in the gestational age of 40-41 weeks.

In our study, incidence of severe anaemia (6.8% vs. 4.4%; p>0.05), pre mature rupture of membranes (12.4% vs. 14.4%; p>0.05), FGR(4.4% vs. 3.2%; p >0.05) and GDM (2% vs 2.8%; p > 0.05) was comparable in patients of Cases and Control group as per Chi-Square test. Pregnancies complicated with pregnancy induced hypertension (PIH) were significantly higher in Cases (16.8%) as compared to Control (7.2%) as per the Chi-Square test (p<0.05). The incidence of oligohydramnio was significantly higher in Cases compared to Controls as per Chi-Square test (17.6% vs. 1.6%; p<0.05). This finding was similar to the studies of Desai D et al [13].

Desai D et al [13] case-control study of meconium-stained amniotic fluid found incidence of passage of meconium was relatively higher in patients with pregnancy induced hypertension (20%) and pregnancy beyond 40 weeks (14.66%). Total number of patients with meconium aspiration was 18% whereas those with meconium aspiration syndrome were 6 %.

It was observed in the present study that caesarean section was commonly done in the Cases group compared to the Control group (49.6% vs. 26.4%) while spontaneous vaginal delivery was commonly done in Control group compared to the Cases group (38.8% vs. 70.4%)and this difference was statistically significant as per Chi-Square test (p<0.05). 29 (11.6%) and 8 (3.2%) patients in the Cases and Control group respectively underwent instrumental deliveries and this difference was comparable as per Chi-Square test (p>0.05).Similar observations were noted in the studies of Mohammad N et al [14].

Mohammad N et al [14] retrospective study observed among 149 women with MSAF, 99 (66.4%) women had cesarean section while 50 (33.6%) delivered through spontaneous vaginal delivery.

It was observed in our study that 199 (79.6%) neonates in the Cases group were asymptomatic at birth compared to 232 (92.8%) neonates in the Control group and this difference was statistically significant as per the Chi-Square test (p<0.05). Incidence of meconium aspiration syndrome (2.8% vs. 0.8%), neonatal sepsis (2% vs. 1.2%), and Hypoxemic ischaemic encephalopathy (1.2% vs. 0.8%) was comparable between the groups while the incidence of birth asphyxia was significantly higher in Cases Group compared to Control Group as per Chi-Square test (14.4% vs. 4.4%; p<0.05. This is similar to the studies of Mohan M et al [15].

Mohan M et al (15) cross sectional study showed among 130 deliveries complicated with meconium-stained liquor, in 26.2% cases babies had respiratory distress and 16.2% had hypoxic ischemic encephalopathy (HIE). In 33.1% of cases, babies were asymptomatic and in 19.1% babies had NICU admission. Meconium aspiration syndrome occurred in 5.4% babies. Association between neonatal complications in relation to grades of meconium was found to be statistically significant. HIE was high in grade 3 meconium group 45%. In the present study, the mean APGAR score at 1 min was significantly lower in the Cases Group compared to the Control Group as per Student t-test (7.82 ± 2.02 vs. 8.07 ± 1.56; p< 0.05) while the mean APGAR score at 5 mins was comparable between the groups as per the student t-test (8.10 ±1.66 vs. 8.16 ±1.43; p>0.05).

In our study, 33 (13.2%) and 11 (4.4%) neonates in Cases and Control group respectively required NICU admission. The incidence of NICU admissions were significantly higher in the Cases Group compared to the Control Group as per the Chi-Square test ($p<0.05$). The mean NICU stay of neonates in Cases were significantly higher compared to Control as per the student t-test (6.42±2.87 days vs. 22.36±8.60 days; $p<0.05$). Similarly, the hospital stay of these neonates in Cases were significantly higher compared to Control as per the student t-test (22.36±8.60 days vs. 8.45 ± 4.55 days; $p <0.05$). Mundhra R et al [12] and Thobbi VA et al [17] similar observations in their studies. Mundhra R et al [12] prospective observational study observed Infants with MSAF had low Apgar scores at birth and 21.21% of cases needed intensive care unit admissions. Thobbi VA et al (17) prospective observational study reported thick MSAF group had significantly higher (17%) NICU admissions.

It was observed in the present study that 170 (68%) and 210 (84%) patients in the Cases and Control group respectively had reactive NST. The incidence of fetal distress was significantly higher in Cases compared to Control as per the Chi-Square test ($p <0.05$). This is in concordance to the studies of Thobbi VA et al [17]. Thobbi VA et al [17] prospective observational study showed 45.8% fetuses with thick MSAF showed signs of fetal distress on the non-stress test as compared to 10.5% in the thin MSAF group. Fetal distress was found more common in thick MSAF while cases of thin MSAF had reactive NST.

It was observed in our study that 21 (8.4%) and 7 (2.8%) neonates in the Cases and Control Group died in our study. There was no significant difference between the groups as per the Chi-Square test ($p>0.05$). This finding was similar to the studies of Mundhra R et al [12]. Mundhra R et al [12] prospective observational study found meconium aspiration was seen in 5 cases and 5 babies who were born to cases had early neonatal deaths, though the difference was not statistically significant as compared to controls.

In the present study, there was the significantly higher number of patients with Grade 2 MSL (40.2%) and Grade 3 MSL (71.4%) that underwent Caesarean section as compared to patients with Grade 1 MSL (25.9%) as per the Chi-Square test ($p<0.05$). This is comparable to the studies of Patel S et al [16]. Patel S et al [16] prospective observational study showed out of 55 grade III MSL cases, 24 were primi, 10 multipara and 21 with previous history of CS. MAS in 4 fetus of primipara mother and 8 fetuses of multipara mother. 3 fetuses delivered to mother with the history of previous CS showed MAS. Association between Maternal age and grades of MSL showed a significant association between both the variables.

In our study, the mean APGAR Score at 1 min of neonates was significantly higher in patients with Grade 1 MSL (8.08±1.76) and Grade 2 MSL (7.81±1.95) compared to patients with Grade 3 MSL (7.65±2.28) as per the ANOVA test ($p<0.05$). The mean APGAR Score at 5 mins of neonates was significantly higher in patients with Grade 1 MSL (8.19±1.39) and Grade 2 MSL (8.20±1.69) compared to patients with Grade 3 MSL (7.92±1.81) as per ANOVA test ($p<0.05$). Similar observations were noted in the studies of Thobbi VA et al [17].

Thobbi VA et al [17] prospective observational study showed low Apgar scores were seen in cases with thick meconium-stained liquor. Apgar scores of less than 5 were found more commonly associated with thick MSAF (52.1%) whereas only 28% of cases with thin MSAF had Apgar scores less than 5.Apgar score at 5 minute were seen to be improved (>5) in both groups of thick and thin MSAF as compared to Apgar scores at 1 minute.

Conclusion

Thick meconium-stained amniotic fluid is associated with the increased rate of intervention in the form of lower segment caesarean section (LSCS) and instrumental delivery, increased neonatal morbidity, in the form of Meconium encephalopathy, and increased neonatal mortality as compared with thin meconium-stained amniotic fluid. Till such time that better strategies for management of meconium-stained neonates are outlined the best course would be careful intrapartum fetal heart rate monitoring and timely detection of fetal asphyxia. Meconium-stained amniotic fluid and the adverse neonatal outcome are associated with high-risk pregnancy like PIH and oligohydramnios, therefore, MSAF can be prevented with early screening, prompt recognition, quick and proper management. The presence of thick meconium needs close monitoring as it is associated with decreased APGAR score and increased NICU stay that‟s why early and timely obstetrical intervention and appropriate neonatal care, to minimize meconium related complications and improve fetal outcome.

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