



STUDY OF NEONATAL OUTCOME IN MECONIUM STAINED AMNIOTIC FLUID

Pediatrics

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ABSTRACT

Background: This study was done to find out the incidence of live births with meconium stained amniotic fluid, their mode of delivery, maternal risk factors and the neonatal outcome.

Materials & Methods: This hospital based prospective observational study was conducted in Department of Pediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Bihar over a period of 2 years. 348 live births with MSAF were included and their outcomes were noted in terms of morbidity and mortality.

Results: Overall incidence of MSAF was 7.13. Risk factors encountered were maternal age <25 years, pre-eclampsia, PROM, and primi-gravida. LSCS was the most common delivery among thick-MSAF group. Meconium Aspiration Syndrome developed in 7 babies (2.01%). Overall neonatal mortality was 0.86%.

Conclusion: The presence of MSAF at delivery is a potential sign of fetal compromise. Alerting the paediatrician and proper resuscitation of babies born through MSAF reduces the overall morbidity and mortality.

KEYWORDS

MSAF, pre-eclampsia, meconium aspiration syndrome, birth asphyxia

INTRODUCTION

Meconium stained amniotic fluid has long been implicated as a factor influencing fetal wellbeing during intra-partum and post-partum periods. It was the famous ancient Greek philosopher Aristotle who, first describing meconium stained amniotic fluid, conferred on this condition the name “meconium-arion”, literally meaning “opium-like”. Meconium staining of amniotic fluid (MSAF) complicates delivery in approximately 8% to 25% of livebirths. Approximately 5% of the neonates born through MSAF develop meconium aspiration syndrome (MAS) and approximately 50% of these infants require mechanical ventilation^[1]. The mortality rate of meconium stained newborns is considerably higher than that of non-stained newborns. The decline in neonatal deaths due to MAS during the last decades is related to improvements in obstetric and neonatal care.

This study was undertaken to detect the incidence, mode of delivery, risk factors and neonatal outcome in neonates born through meconium stained amniotic fluid.

MATERIALS & METHODS

The present study was conducted between November 2015 and October 2017 at Department of Pediatrics associated with Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar.

Inclusion Criteria

- All meconium stained live births born to singleton pregnancy irrespective of maternal age, parity, maternal risk factors, presentation and stage of labour.
- Mothers who are booked cases in DMCH, Laheriasarai, Bihar
- Exclusion Criteria
- Babies with congenital malformations
- Still births
- Babies born to mothers who were not booked in antenatal period in DMCH, Laheriasarai, Bihar.
- Multiple gestation
- Babies with meconium stained liquor referred to NICU from Obstetrics and Gynaecology Department of DMCH.

Written informed consent was obtained prior to the enrolment of subjects in the study. Detailed mother's history, risk factors, progress of labour, meconium staining of amniotic fluid and mode of delivery were noted. Evaluation and decisions regarding resuscitation measures were guided by assessment of respiration, heart rate, and color and tone of the baby. Apgar scores were conventionally assigned and recorded

in the newborn's chart. If any meconium staining was present, suctioning of the mouth and nostrils was done immediately after delivery. If the infant was depressed with poor muscle tone and/or a heart rate <100 beats/min, tracheal intubation and suctioning was performed. If the infant was vigorous then routine care was given. Babies born through meconium stained amniotic fluid were be classified into thin and thick meconium stained group for the study purpose.

If the baby was asphyxiated at birth or had signs of meconium aspiration then the baby was shifted to NICU and managed according to standard protocols and outcomes were noted in terms of morbidity and mortality. Babies who were non-asphyxiated and had no abnormal findings were shifted to mother side in the maternity ward. These babies were observed for the development of respiratory distress or signs of sepsis over the next 72 hours and were shifted to NICU if they developed any

Statistical Analysis

Statistical analysis was done by descriptive statistics as mean, SD and percentage etc. Chi-square test was applied to find out association between various parameters in thin and thick MSAF. $p < 0.05$ was considered as significant. The statistical software namely Excel (Microsoft) version 12 was used to analyze the data.

RESULTS

During the study period 5609 deliveries were conducted (4257 booked and 1352 unbooked cases). The overall incidence of MSAF was 7.13% in our study. Among the booked cases, 363 i.e., 8.53% were meconium stained out of which 348 cases were included in the present study as they satisfied the inclusion criteria.

15 cases were excluded from the study (2 multiple gestation and 13 still births). 197 cases had thin meconium and 151 cases had thick meconium. Out of total 348 booked deliveries with meconium stained amniotic fluid 180 cases i.e., 51.72% were males and 168 cases i.e., 48.28% were females.

Maternal age (in yrs.)	No. of MSAF cases					
	Thin	%	Thick	%	Total	%
<25	97	49.24	100	66.22	197	56.61
25-30	84	42.64	48	31.79	132	37.93
>30	16	8.12	3	1.99	19	5.46

Total	197	56.61	151	43.39	148	100
Mean±SD	24.59±5.06 yrs.	23.39±6.12 yrs.	24.07±6.47 yrs.			
Value of $\chi^2 = 12.904$, $p=0.0016$, significant.						

Table 1 : Relationship of MSAF with maternal age

In the current study, 190 (54.6%) were primi-para, 139 (39.94%) were gravida-2 and 19 (5.46%) have conceived 3 or more times. In both the thin-MSAF and thick-MSAF groups, cases were more among primi mothers.

It was observed that the number of meconium stained cases were more among babies who were born at term (334, 95.97%). There were no meconium staining in babies who were born premature. Most of the babies with MSAF had birth weight between 2.6-3.5 kg (64.65%) followed by 1.6-2.6 kg (25.57%) and then ≥ 3.6 kg (9.78%) and there was no much difference between thin and thick MSAF groups.

196 (56.31%) were complicated by maternal diseases. 19 mothers (5.46%) had other pre-existing conditions like epilepsy, diabetes mellitus, heart disease, and hypothyroidism.

Maternal Risk factors	No. of MSAF cases					
	Thin	%	Thick	%	Total	%
Anaemia	12	6.09	10	6.62	22	6.32
HDP	52	26.39	20	13.24	72	20.68
PROM	37	18.78	16	10.60	53	15.23
Obstructed labour	5	2.53	10	6.62	15	4.31
Oligohydramnios	9	4.57	6	3.97	15	4.31
Others	10	5.08	9	5.96	19	5.46
Nil	72	36.55	80	52.98	152	43.68
Total	197	56.61	151	43.39	348	100

Table 2 : Relation of maternal risk factors with MSAF

Value of $\chi^2 = 19.729$, $p=0.0031$, significant. HDP – Hypertensive Disorders of Pregnancy, PROM – Premature Rupture of Membranes

Indication for surgery was fetal distress in 78 (46.42%) cases. Of these, 45 had thick MSAF and 33 had thin-MSAF. Other indications were non-progress of labour, previous-LSCS, post maturity, eclampsia and abruptio-placenta, large-for date babies.

Mode of delivery	No. of MSAF cases					
	Thin	%	Thick	%	Total	%
NVD	98	49.75	54	35.76	172	49.43
LSCS	96	48.73	92	60.93	168	48.27
FAD	2	1.01	2	1.32	4	1.15
VAD	1	0.51	3	1.99	4	1.15
Total	197	56.61	151	43.39	348	100

Table 3 : Mode of Delivery in relation to Consistency of Meconium

Value of $\chi^2 = 7.879$, $p=0.0486$, significant. NVD – Normal Vaginal Delivery, LSCS-Lower Segment Caesarean Section, FAD-Forceps Assisted Delivery, VAD-Venthouse Assisted Delivery

In this study, 297 babies (85.34%) were born vigorous. In the delivery room, tracheal intubation for meconium aspiration followed by immediate extubation was performed in 42 (12.07%) newborns, while intubation followed by mechanical ventilation support was used in 9 (2.59%) cases. All the newborns who required mechanical ventilator support belonged to the thick-MSAF group.

Immediate intervention	No. of MSAF cases					
	Thin	%	Thick	%	Total	%
No intervention	181	91.88	116	76.82	297	85.34
Endotracheal intubation for aspiration followed by immediate extubation	16	8.12	26	17.22	42	12.07
Endotracheal intubation followed by mechanical ventilation	0	0	9	5.96	9	2.59
Total	197	56.61	151	43.39	348	100

Table 4 : Immediate intervention post-delivery in relation to MSAF

Value of $\chi^2 = 19.873$, $p=0.0001$, significant.

At APGAR score of 0-3 at 1 minute, there were 9 (5.96%) severely asphyxiated newborns in thick-MSAF group and none in thin-MSAF group. Of these, 5 babies were born via LSCS, 2 via NVD and 2 via instrumental delivery. APGAR of 4-6 at 1 minute was recorded in 16 (8.12%) thin-MSAF and 26 (17.22%) thick-MSAF cases. The mean-APGAR was 6.68 ± 1.69 .

331 (95.12%) babies had APGAR 7-10 at 5 minutes. Out of the 9 babies who had APGAR of 0-3 at 1 minute, 8 improved with immediate post-delivery interventions.

Out of 197 babies with thin meconium stained amniotic fluid, 42 babies had NICU admissions i.e., 21.32%, whereas in thick meconium stained amniotic fluid out of 151 babies, 66 (43.71%) were admitted in NICU.

All babies who required resuscitative efforts were shifted to NICU directly from the delivery room. Out of 297 babies who were vigorous at birth, 48 were shifted to NICU within 48 hours as they developed signs of respiratory distress within this time frame.

Outcome	Thin MSAF	%	Thick MSAF	%	No. of cases	%
Uncomplicated	25	59.52	23	34.85	48	44.44
Birth asphyxia	15	35.71	19	28.79	34	31.48
HIE	1	2.38	9	13.64	10	9.26
MAS only	0	0	4	6.06	4	3.70
MAS+PPHN	0	0	3	4.55	3	2.78
Sepsis	1	2.38	8	12.12	9	8.33
Total	42	100	66	100	108	100

Table 5 : Relationship of MSAF with NICU outcome

Value of $\chi^2 = 14.796$, $p=0.0113$, significant. HIE-Hypoxic Ischaemic Encephalopathy, PPHN – Persistent Pulmonary Hypertension of Newborn

34 babies were diagnosed with birth asphyxia (15 thin-MSAF and 19 thick-MSAF). MAS developed in a total of 7 (7/348-2.01%) cases, of which, 3 babies progressed to PPHN. Overall, morbidities were more in thick-MSAF group compared to thin-MSAF and it was statistically significant. 48 (44.44%) did not develop any complications.

Neonatal mortality was seen only in thick meconium stained amniotic fluid i.e., 3 (0.86%). Of these, 2 babies had MAS and the mortality rate among MAS group was 25.87% (2/7). There was no death in thin meconium stained amniotic fluid group.

DISCUSSION

MSAF has been implicated as a factor influencing fetal wellbeing during the intrapartum and postpartum periods. Its importance is judged by the NRP guidelines which stresses on colour of liquor (clear or meconium stained) as one of the parameters in initial assessment of newborn. Incidence of MSAF in labour widely varies as reported from time to time by different studies. In our study, there were 400 out of 5609 deliveries which had meconium stained liquor, making the overall incidence 7.13%. However, Rossi et al. [2] reported a higher incidence of 22% due to more number of no-care mothers attending their hospital. In the present study, booked cases were 4257, of which 363 were meconium stained (8.53%) and un-booked cases were 1352 of which 37 were meconium stained (2.7%).

In our study the male: female ratio was 1.07:1. In both the groups, cases were more among male babies. This difference was statistically non-significant ($p>0.05$).

In the present study, when maternal age was considered, incidence of MSAF was more in mothers <25 years old. The incidence was lower in mothers more than 30 years (5.46%). This was true in both thin and thick-MSAF groups and the result was statistically significant ($p=0.0016$). Most of the deliveries occurred in the age <25 years and hence the incidence of MSAF is high in this age group. Similar study by Bharati et al. [3] showed an incidence of 74.3% in the age group 20-25 years.

Highest incidence of MSAF, in our study, was seen in primi-gravida in both thin and thick-MSAF groups. The result was statistically

significant ($p=0.0323$) indicating an association between meconium staining of liquor and parity of the mother. More number of deliveries occurred in primi in our study, hence the high incidence of MSAF in this group. The present study correlates with the study done by Bharati et al.^[3] and Gokhroo et al.^[4].

Meconium staining in amniotic fluid increases with gestational age. This can be explained by the fact that the hormone 'motilin' is secreted in increasing quantities by the fetus as gestational age advances and most meconium discharges are said to occur in post-dated gestations because the motilin levels are highest then^[5]. Gupta et al.^[6], in his study, observed that the highest incidence of MSAF was in post-term babies (55%) and lowest in premature babies (7.8%).

In the present study, highest incidence of MSAF occurred in babies who were born at term (95.97%). Among our included cases, there were no premature deliveries with meconium. In both thin and thick-MSAF groups, more number of meconium stained deliveries were at term but the difference was not statistically significant ($p>0.05$). Very few cases were noted in post-term births (4.03%). This is probably due to more number of booked cases, regular antenatal check-ups and early interventions in case of meconium stained amniotic fluid. Our study is in co-relation with 2012 study conducted in Hyderabad by Joseph et al.^[7]. He observed an incidence of 97.5% among term babies and 2.5% among post-term babies. There were no preterm babies with meconium stained liquor.

We observed that most of the babies with MSAF had birth weight between 2.6-3.5 kg (64.65%). Sedaghatian et al.^[8] in 2000 and Mundhra et al.^[5] in 2013 observed similar results in their studies. In our study, the differences in relation to birth weight between the 2 groups were not statistically significant ($p>0.05$).

Hypertensive disorders are one of the common maternal medical conditions associated with pregnancy. Association of PIH with MSAF is caused by an underlying utero-placental insufficiency, which causes fetal hypoxia, resulting in meconium passage. In a study done by Vora et al.^[9] in 2014, 50% cases had maternal risk factors. The most encountered was PIH (60%) followed by oligohydramnios (28%). Our study is in co-relation with Vaghela et al.^[10] in which, 59% meconium stained cases were associated with maternal risk factors mainly pre-eclampsia and PROM.

In the present study almost equal number of patients delivered by normal vaginal delivery (49.43%) as well as by caesarean section (48.27%). Only 2.3% cases had assisted vaginal delivery. There is statistically significant difference in patients who had NVD and LSCS between thin-MSAF and thick-MSAF groups. Our study is in tune with the study conducted by Bharati et al.^[3] and Naveen et al.^[11].

Another finding we noticed is that among 168 LSCS cases, indication for surgery was fetal distress in 78 (46.42%) cases. In contrast to our study, Wong et al.^[12] found that only 13.2% of MSAF underwent LSCS. Such lower rate of LSCS could be due to incorporation of scalp pH sampling in their study unlike ours.

In the present study, there was a good correlation between Apgar score and MAS. Out of the 9 neonates, all belonging to thick-MSAF group, who had APGAR ≤ 3 at 1 minute, 7 (2.01%) developed MAS. This gives credence to the theory that meconium aspiration is predominantly an intrauterine event which occurs in response to continued fetal gasping in a hypoxic environment and tracheal suctioning at birth cannot completely eliminate development of MAS^[13,14]. Also, none of the neonates who were vigorous at birth and required only routine newborn care, developed MAS. Therefore, a "selective" approach of tracheal suctioning can be adopted for babies born through MSAF, reserving it for those babies with evidence of fetal distress in-utero and/or, who are in a depressed state at birth. Vigorous neonates only need careful observation after thorough oro-naso-pharyngeal suction^[15,16,17].

NICU admissions were more with thick-MSAF (43.7%) as compared to thin-MSAF (21.3%). Our study is comparable with Vaghela et al.^[10] and Rajput et al.^[18] who also observed a higher incidence of NICU admission among thick meconium stained neonates.

Of 348 cases, morbidity in thin MSAF group was 21.32% and thick MSAF group was 41.72% and this difference was statistically

significant ($p=0.02$). This was comparable with Vaghela et al.^[10] and Rajput et al.^[18]. MAS occurs in 1-3% of all cases of MSAF and in 10-30% of neonates with meconium aspiration^[6]. In this study, MAS was noted only in thick-MSAF group and the incidence was 2.01%. All of them required ventilator support and administration of surfactant. 3 of these neonates subsequently developed PPHN. Vaghela et al.^[10] and Rajput et al.^[18] found an incidence of 5% and 6% in their studies respectively. Bhide et al.^[19] reported a high incidence of 22% meconium aspiration syndrome.

In our study, 3 babies expired, all belonging to thick-MSAF group. 2 babies expired due to MAS itself and 1 due to late onset septicemia. The overall mortality was 0.86% (3 out of 348 MSAF) and is comparable with mortality rate observed by Hanoudi et al.^[7, 4]. Mortality rate among babies who developed MAS was 25.87% (2/7).

CONCLUSION

The presence of Meconium stained amniotic fluid (MSAF) at delivery is a potential sign of fetal compromise. Our study shows thick meconium stained amniotic fluid is associated with increased rate of intervention, neonatal morbidity and mortality compared with thin MSAF. Alerting the paediatrician about the meconium staining of amniotic fluid and proper resuscitation of babies born through MSAF reduces the overall morbidity and mortality.

REFERENCES

- Cloherly JP, Eichenwald EC, Stark AR. Meconium Aspiration. Manual of Neonatal Care. 7th Ed. New Delhi: Lippincott Williams & Wilkins, a Wolters Kluwer business, 2012, 429-34.
- Rossi EM, Philipson EH, Williams TG, Kalhan SC. Meconium aspiration syndrome: intrapartum and neonatal attributes. American journal of obstetrics and gynecology. 1989; 161(5):1106-10.
- Bharati Rao, Chandashekar GS, Rao D, Hegde P, Ghate S V. Meconium stained amniotic fluid. A prospective study. Karnataka Paediatr Journal. 2011; 25(1):21-6.
- Gokhroo K, Sharma U, Sharma M. Various maternal factors responsible for meconium stained amniotic fluid. J ObstetGynaecol India. 2001; 52(6):40.
- Mundhra R, Agarwal M. Fetal outcome in meconium stained deliveries. Journal of clinical and diagnostic research: JCDR. 2013; 7(12):2874.
- Gupta V, Bhatia BD, Mishra OP. Meconium stained amniotic fluid: antenatal, intrapartum and neonatal attributes. Indian pediatrics. 1996 1; 33:293-8.
- Joseph K, UdayKiran G, Reddy DR, Jain CS. Incidence of Meconium Aspiration Syndrome and Associated Risk Factors in Babies Born to Mothers with Meconium Stained Amniotic Fluid.
- Sedaghatian MR, Othman L, Hossain MM, Vidyasagar D. Risk of meconium-stained amniotic fluid in different ethnic groups. Journal of Perinatology. 2000; 20(4):257.
- Vora H, Nair S. Study of Meconium Aspiration Syndrome in Neonates.
- Vaghela HP, Deliwala K, Shah P. Fetal outcome in deliveries with meconium stained liquor. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017; 3(4):909-12.
- Naveen S, Kumar SV, Ritu S, Kushia P. Predictors of meconium stained amniotic fluid: a possible strategy to reduce neonatal morbidity and mortality. J ObstetGynecol India. 2006; 56(6):514-7.
- Wong SF, Chow KM, Ho LC. The relative risk of fetal distress in pregnancy associated with meconium-stained liquor at different gestation. Journal of Obstetrics and Gynaecology. 2002; 22(6):594-9.
- Wiswell TE, Henley MA. Intratracheal suctioning, systemic infection, and the meconium aspiration syndrome. Pediatrics. 1992; 89(2):203-6.
- Falciglia HS. Failure to prevent meconium aspiration syndrome. Obstetrics & Gynecology. 1988; 71(3):349-53.
- Katz VL, Bowes WA. Meconium aspiration syndrome: reflections on a murky subject. American journal of obstetrics and gynecology. 1992; 166(1):171-83.
- Wiswell TE, Bent RC. Meconium staining and the meconium aspiration syndrome: unresolved issues. Pediatric Clinics of North America. 1993; 40(5):955-81.
- Linder N, Aranda JV, Tsur M, Matoth I, Yatsiv I, Mandelberg H, Rottem M, Feigenbaum D, Ezra Y, Tamir I. Need for endotracheal intubation and suction in meconium-stained neonates. The Journal of pediatrics. 1988; 112(4):613-5.
- Rajput U, Jain A. Impact of meconium stained amniotic fluid on early neonatal outcome. Journal of Evolution of Medical and Dental Sciences. 2013; 2(45):8788-94.
- Bhide SS, Shendurnikar N, Aiyer S, Baxi SR. Neonatal outcome after meconium stained amniotic fluid. J ObstetGynecol India. 1993; 44:933-5.
- Hanoudi BM, Murad AM, Ali AD. Meconium Staining of Amniotic Fluid: A Clinical Study. British Journal of Medicine & Medical Research. 2014; 4(3):914-21.