Original Research Article

Risk factors, clinical characteristics and outcome in neonates with meconium aspiration syndrome - an experience at tertiary care hospital

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Received: 14 November 2021

Revised: 12 December 2021

Accepted: 21 December 2021

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ABSTRACT

Background: Meconium aspiration syndrome (MAS) is a life-threatening condition involving respiratory system, the present study was undertaken to study maternal risk factors associated with MAS, etiology, incidence of MAS born via meconium-stained amniotic fluid (MSAF) and to assess outcome of neonates born with MAS.

Methods: The present study was carried out at Government Medical College, Baramulla from August 2017 to August 2019, all neonates fulfilling inclusion criteria got admitted in neonatal intensive care unit (NICU) and were included in our study after obtaining informed consent from their parents. The demographic and factors related to MAS were recorded through predesigned proforma and analyzed using Microsoft excel. Mean and standard deviation were determined for quantitative variables whereas frequency and percentages were calculated for qualitative variables.

Results: Newborn with MAS were mostly depressed at birth and hypoxic ischemic encephalopathy (HIE stage III) was main cause of neonatal mortality, significantly contributing 37.5% of cases of MAS. Neonatal mortality in MAS was also associated with 5 minute low APGAR score. There was significant and strong association between the birth weight and mortality. Thick MSAF was significantly associated with need for mechanical ventilation and subsequently higher mortality.

Conclusions: We conclude from our study that MAS is most commonly seen in term and post term babies with birth weight >2.5 kg. Risk factors should be identified and timely intervention should be done to reduce, mortality and morbidity in MAS.

Keywords: Meconium aspiration syndrome, Risk factors, APGAR score, Neonates outcome

INTRODUCTION

Meconium aspiration syndrome (MAS) is a life-threatening condition involving respiratory system, affecting newborn born via meconium-stained amniotic fluid (MSAF). Meconium can be defined as dark greenish brown material excreted in utero, passed by more than 90% of full term neonates within 24 to 48 hours of birth.¹ Presence of meconium in amniotic fluid is a ominous sign of fetal distress, leading to increase in neonatal mortality.² MSAF occurs in 10-15% of live births, among them 5% of babies delivered through MSAF develop MAS with

mortality of 3 to 5% in newborn due to MAS.³ MSAF occurs with increasing frequency along with increase in gestational age of the fetus, the incidence of MSAF being as is approximately 30% in post term pregnancy, while majority of neonates born with MSAF are term or post term.^{4,5}

MAS is defined as development of respiratory distress (RD) soon after birth with radiographic (RAY) evidence of aspiration pneumonitis, in the presence of meconium staining of amniotic fluid along with staining of umbilical cord, nails and skin.⁶ Several studies have delineated

various morbidity pattern of MAS, also other factors leading to MAS are acute or chronic hypoxia, sepsis and acidosis.^{7,8}

The present study was conducted out to identify the risk factors causing MAS along with clinical profile and their outcome, so that proper diagnosis and timely intervention can reduce morbidity and mortality due to MAS.

METHODS

The study designed was a hospital based prospective observational study carried out at Government Medical College, Baramulla, India from August 2017 to August 2019 after obtaining proper approval from institutional ethical committee. In present study, out of 674 deliveries with MSAF, 69 (10.2%) neonates develop MAS were enrolled in our study plan and all cases fulfilling inclusion criteria were admitted in NICU.

Inclusion criteria

It included: history of MSAF, RD within 24 hours of life, chest radiograph X-ray, term and post term newborns, and requiring supplemental oxygen.

Exclusion criteria

It included: preterm with <36 weeks gestational age, transient tachypnea of newborn (TTN), hyaline membrane disease (HMD), congenital pneumonia, and MSAF neonates without X-ray findings or RD.

Data regarding the cases were entered into predesigned proforma including antenatal history, mode of delivery, interventions done. Detailed clinical examination particularly of respiratory system, vitals, meconium consistency (thick/thin) were recorded. APGAR scoring at 1 and 5 minutes was recorded. New Ballards scoring system was used to assess gestational age. Resuscitation measures, stomach wash was done in all babies of MAS and were recorded. Bag and tube ventilation was done after endotracheal intubation in non-vigorous babies, as per newborn resuscitation protocol (NRP). Decision of mode of oxygen to be administered were made by the Downe's score was used to assess respiratory distress in neonates and regarding mode of oxygen administration. All the neonates admitted with MAS were followed up for one week in NICU.

Complete blood count (CBC), chest X-rays, arterial blood gas analysis, blood glucose, serum electrolyte and calcium, kidney function test, C-reactive protein (CRP), blood culture and sensitivity were done in all cases of MAS.

Primary outcome in MAS was measured in terms of mortality.

Secondary outcomes was assessed in terms of complications of MAS: asphyxia, pneumothorax, need for assisted ventilation, and duration of hospital stay.

Data was recorded and analysed using statistical package for the social sciences (SPSS) version 16 and online calculators. Chi square test was used for statistical analysis, while as p value of <0.05 is considered statistically significant.

RESULTS

In our study, both sexes were affected with slight male preponderance (N=42, 60.8%), while females were (N=27, 39.2%).

Table 1: Maternal and gender distribution.

Factors	Frequency (N)	Percentage (%)	P value
Maternal factors			
Fetal distress (obstructed labour)	36	52.1	<0.001
PIH	16	23.1	
PROM	9	13	
Others	8	11.8	
Gender distribution			
Males	42	60.8	0.071
Females	27	39.2	

Majority of neonates with MAS were term (N=56, 81.1%), post term (N=7, 10%) and borderline term (N=6, 8.6%) with gestational age >38 weeks in >90% of cases.

Table 2: Delivery and meconium type associated with MAS.

Factors	Frequ- ency (N)	Percentage (%)	P value
Mode of delivery			
Caeserian	41	59.4	<0.001
Vaginal	19	27.5	
Assisted delivery	9	13.1	
Meconium type			
Thick	21	30.4	<0.001
Thin	48	69.6	

Among MAS neonates commonest maternal risk factor leading to fetal distress was obstructed labour (N=36, 52.1%) followed by pregnancy induced hypertension (PIH) (N=16, 23.1%), and premature rupture of membranes (N=9, 13%). Caesarean section (LSCS) was done in 41 (59.4%) patients and vaginal delivery in 19 (27.5%) patients and assisted delivery was done in 9 patients. Thick and thin meconium was present in 37 (53.6) and cases respectively.

Table 3: Gestational age in MAS.

Gestational age (weeks)	Frequency (N)	Percentage (%)	P value
36-38	6	8.6	<0.001
38-40	56	81.1	
>40	7	10	

Table 4: Birth weight with MAS.

Birth weight (kg)	Frequency (N)	Percentage (%)	P value
2.5-3	39	56.5	<0.001
3-3.5	18	26	
>4	8	11.5	
<2.5	4	5.7	

Table 5: APGAR scoring in MAS.

APGAR score	Frequency (N)	Percentage (%)	P value
<3	22	31.8	<0.001
3-7	42	60.8	
>7-10	5	7.2	
After resuscitation at 5 min with APGAR score <7			
>7-10	43	62.3	0.041
<7	26	37.6	

While as regarding neonatal risk factors, mortality and morbidity due to MAS was greater in borderline term and those neonates with 5-minute APGAR score <3.

Regarding birth weight maximum number of cases with MAS were 2.5-3 kg (N=39, 56.5%), followed by 3-3.5 kg (18, 26%), while 8 (11.5%) cases were >4 kg and 4 (5.7%) cases were <2.5 kg.

Among 69 cases, 22 (31.8%) patients had APGAR score <3 followed by 42 (60.8%) patients with APGAR score 3-7 and 5 (7.2%) cases were having APGAR score >7-10. Neonates with APGAR score <7 showed marked improvement in APGAR score after 5 minutes of resuscitation i.e. 43 (62.3%) patients showed APGAR score >7-10 while 26 (37.6%) patients showed APGAR score <7.

Out of 69 neonates with MAS, most common complication was birth asphyxia occurred in 29 (42%) patients, followed by acute respiratory failure (ARF) in 18 (26%) patients, sepsis in 15 (21.7%) patients and pneumothorax in 3 (4.3%) patients.

Out of 69 cases with MAS, 20 (28.9%) babies were non vigorous and required ventilatory support, while 49 (71%) cases need other modes of oxygen support. Among 20 babies 3 (15%) neonates were successfully weaned off and

subsequently discharged, while as 85% among 20 non vigorous neonates expired.

Meanwhile, among 20 babies 17 (85%) babies had thick meconium and associated with highest mortality.

Table 6: Treatment and outcome of MAS babies.

Treatment given	Frequency (N)	Percentage (%)	P value
Oxygen	37	53.6	<0.001
Oxygen with CPAP	12	17.3	
Ventilatory support	20	28.9	
Neonatal outcome of mas			
Recovered cases	52	75.4	<0.001
Mortality	17	24.6

Figure 1: Complications in MAS

RF=Respiratory failure, asphyxia=birth asphyxia, pneumothx=pneumothorax, sepsis=others

DISCUSSION

During our study period out of 674 deliveries with MSAF, 69 (10.2%) neonates born among MSAF deliveries developed MAS, our results are concordant as reported by other studies.^{9,10} In our study males were more affected than females which has been reported by other studies as studied by Narang et al and Sori et al.^{9,11} In our study 41 (59.4%) neonates were delivered by caesarean-section and 19 (27.4%) neonates were delivered vaginally, while as mortality was high in vaginally delivered neonates, reinforcing that caesarean section should be preferred over vaginal route in case of high risk mothers thereby indicate that in a high risk mothers caesarean-section should be method of choice for delivery. This is in accordance with results as reported by Rajput et al (LSCS in 83%) and Sori et al (LSCS in 43.7%).^{11,12}

Regarding risk factors, obstructed labour and resultant fetal distress is commonly found in neonates, who develop respiratory distress after MSAF. In our study fetal distress due to obstructed labour was seen in 52.1% cases of MAS

which is consistent as reported by other studies.^{13,14} While as PIH was seen in 16 cases (23.1%) and PROM in 9 cases (13%), which is concordant as reported by other studies.^{15,16} Satish et al in 2014 at Sangli, Maharashtra studied that 59% neonates with MAS were between 38-40 weeks, these results are consistent with our study where >80% cases were >38 weeks of gestation.¹⁷

Goud et al studied that majority of neonates with MAS weighed 2.5 to 3 kg and 4.2% of neonates weighed >3.5 kgs, which is in accordance with our study i.e. birth weight 2.5 to 3 kgs (N=39, 56.5%) and birth weight 3 to 3.5 kgs (N=18, 26%).⁴ Fischer et al also reported APGAR of <3 at 1 min was 51.7%, which improved after treatment to APGAR of <5 at 5 min to 32.5% with p value of 0.0001, similar reports were also observed during our study i.e. neonates with APGAR score <7 showed marked improvement in APGAR score after 5 minutes of resuscitation i.e. 43 (62.3%) patients showed APGAR score >7-10 while 26 (37.6%) patients showed APGAR score <7.¹⁸

In our study, out of 69 neonates with MAS, most common complication was birth asphyxia occurred in 29 (42%) patients, followed by ARF in 18 (26%) patients, sepsis in 15 (21.7%) patients and pneumothorax in 3 (4.3%) patients which is consistent as reported by other studies.^{9,19} Besides this, 17 (24.6%), which is consistent as reported by other studies babies died in our study. Thick meconium is generally associated with poor perinatal outcomes as reported by some studies, which is consistent with our study in which 17 (85%) neonates among 20 neonates requiring assisted ventilation had thick meconium and associated with highest mortality.^{20,21}

Viraraghavan et al studied that mortality was significantly higher in the non-vigorous than vigorous neonates with (p<0.001), which is in accordance with our study in which 85% among 20 non vigorous neonates expired.²² Besides this, intrapartum or postpartum endotracheal suctioning of neonates (vigorous babies) born through MSAF should not be done according to current guidelines, while suggesting expectant management.²³

Limitations

The main limitation in our study was reduced sample size which can in future be improved to strengthen our research regarding MAS.

CONCLUSION

From our study, we conclude that MAS is termed as presence of meconium below the vocal cords and in the lungs. MAS is one of the main and common cause of respiratory distress in the newborn. Increased prevalence was seen in neonates born through MSAF and babies born by caesarean section. Also majority of neonates were term/post term with more than 38 weeks of gestation. Poor outcome was seen in neonates having APGAR score <7 at

5 minutes, with thick meconium and non-vigorous babies. Therefore risk factors should be identified along with proper diagnosis so that timely intervention should be done to reduce, mortality and morbidity in MAS.

Funding: No funding sources

Conflict of interest: None declared

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

REFERENCES

1. Sherry SN, Kramer I. The time of passage of the first stool and first urine by the newborn infant. J Pediatr. 1955;46(2):158-9.
2. Sadaf R, Mehrunnisa K, Khanum F, Zahid M, Khan S. Fetal outcome in deliveries of patients with meconium stained liquor. J Med Sci. 2012;20:165-7.
3. Kliegman R, Bonita S, St Geme J, Stoll N. Nelson Textbook of Pediatrics. In: Nelson Textbook of Pediatrics. 1st ed. Philadelphia: Elsevier Saunders. 2015;859-62.
4. Goud P, Krishna U. Significance of meconium staining of amniotic fluid in labour. J Obstet Gynaecol India. 1989;39:523-6.
5. Usher RH, Boyd ME, McLean FH, Kramer MS. Assessment of fetal risk in postdate pregnancies. Am J Obstet Gynecol. 1988;158(2):259-64.
6. Avery GB, Fletcher MA, MacDonald MG. Neonatology, pathophysiology and management of newborn, 9th edition. Philadelphia: Lippincott. 2015;552.
7. Bhat RY, Rao A. Meconium-stained amniotic fluid and meconium aspiration syndrome: a prospective study. Ann Trop Paediatr. 2008;28(3):199-203.
8. Eichenwald E, Hansen A, Martin CS. Cloherty and Stark's Manual of Neonatal Care. 8th edition. Philadelphia: Wolters Kluwer. 2017;404-34.
9. Narang A, Nair PMC, Bhakoo ON, Vashist K. Management of meconium stained amniotic fluid- A team approach. Indian Pediatr. 1993;30:9-13.
10. Bharti Rao, Chandrashekhar GS, Rao D, Hegde P, Ghate SV. Meconium stained amniotic fluid: a prospective study. Karnataka Pediatr J. 2011;25(1):21-2.
11. Sori DA, Belete A, Wolde M. Meconium Stained Amniotic Fluid: Factors affecting Maternal and Perinatal Outcomes at Jimma University Specialized Teaching Hospital, South West Ethiopia. Gynecol Obstet (Sunnyvale). 2016;6(394):2161-932.
12. Rajput U, Jain A. Impact of meconium stained amniotic fluid on early neonatal outcome. J Evol Med Dent Sci. 2013;2(45):8788-94.
13. Coughtrey H, Jeffery HE, Henderson-Smart DJ, Storey B, Poulos V. Possible causes linking asphyxia, thick meconium and respiratory distress. Austr New Zealand J Obstet Gynaecol. 1991;31(2):97-102.

14. Naqvi SB, Manzor S. association of MSAF with perinatal outcome in pregnant women of 37-42 weeks gestation. *Pak J Surg*. 2011;27(4):292-8.
15. Yeh SY, Paul RH, Schiffrin BS, Martin CB, Hon EH. Significance of meconium during labour. *Am J Obstet Gynecol*. 1975;122:573-80.
16. Fujikura T, Klionsky B. The significance of meconium staining. *Am J Obstet Gynecol*. 1975;121(1):45-50.
17. Ashtekar SD, Renuka S, Gaikwad NK. Clinical study of meconium asp relation to birth weight and gest general hospital Sangli. *Int Med J*. 2014;1(5).
18. Fischer C, Rybakowski C, Ferdynus C, Sagot P, Gouyon JB, et al. A Population-Based Study of Meconium Aspiration Syndrome in Neonates Born between 37 and 43 Weeks of Gestation, *Int J Pediatr*. 2012;321545.
19. Wiswell TE, Cleary GM. Meconium stained amniotic fluid and meconium aspiration syndrome. An update. *Pediatr Clin North Am*. 1998;45:511-29.
20. Rossi EM, Philipson EH Williams TG Kalhan SC, meconium aspiration syndrome: intra partum and neonatal attributes. *AMJ Obstet Gynecol*. 1989;161:1106-10.
21. Naranga A. Management of meconium: a team approach. *Indian Pediatr*. 1993;30:9-13.
22. Viraraghavan VR, Nangia S, Prathik BH, Madarkar BS, Deepshika R, Saili A. Yield of meconium in non-vigorous neonates undergoing endotracheal suctioning and profile of all neonates born through meconium-stained amniotic fluid: A prospective observational study. *Paediatr Int Child Health*. 2018;00:1-5.
23. Vain NE, Szyld EG, Prudent LM, Wiswell TE, Aguilar AM, Vivas NI. Oropharyngeal and nasopharyngeal suctioning of meconium stained neonates before delivery of their shoulders; multicentre, RCT. *Lancet*. 2004;364:597-602.

Cite this article as: Chesti MS, Shahzad N, Goswami S, Gazala S. Risk factors, clinical characteristics and outcome in neonates with meconium aspiration syndrome - an experience at tertiary care hospital. *Int J Contemp Pediatr* 2022;9:178-82.