

Vol 45 (3) September , 2021

Print: ISSN 0304 4904
Online: ISSN 2305-820X



PAKISTAN PEDIATRIC JOURNAL



A JOURNAL OF PAKISTAN PEDIATRIC ASSOCIATION

Indexed in EMBASE/Excerpta Medica, Index Medicus WHO

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ORIGINAL ARTICLE

Outcome of Meconium Aspiration Syndrome in Neonates at Tertiary Care Hospital

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Pak Pediatr J 2021; 45(3): 277-83

ABSTRACT

Objective: To assess the outcome of meconium aspiration syndrome (MAS) in neonates with meconium stained liquor admitted at neonatal intensive care unit of a tertiary care hospital.

Study Design: Descriptive case series.

Place and Duration of Study: Pediatric Department of Liaquat University, Hyderabad, 6 months from 1st November 2018 to 30th April 2019

Material and Methods: There were 186 neonates having history of meconium stained liquor or meconium staining of umbilical cord included in this study. Age, gender, weight, length, gestational age, mode of delivery, place of delivery, development of MAS and outcome were noted.

Results: The average age of the neonates was 9.47 ± 8.41 hours. Frequency of meconium aspiration syndrome in neonates with the history of meconium stained liquor and/or meconium stained umbilicus was 70.97% (132 of 186) cases. Neonates were observed for 48 hours after birth for respiratory distress. In case of respiratory distress neonates were managed accordingly till improvement or death. Regarding meconium aspiration syndrome in neonates, respiratory distress at 0 hour was 86.4% (114 of 118) abnormal x-ray changes occurred in 67.4% (89 of 94) and death occurred in 34.8% (46 of 62).

Conclusion: In this study significantly number of neonates aspirated meconium after passing meconium in the amniotic fluid. Respiratory distress soon after birth was also significant in neonates. A total of 67.4% (89 of 94) neonates had abnormal x-ray findings suggestive of meconium aspiration syndrome. Ratio of death was higher due to unavailability of ventilator support as well as surfactant.

Key Words: *Meconium aspiration syndrome, Meconium stained amniotic fluid, Respiratory distress, Neonates, X-ray*

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Received 5th November 2020;
Accepted for publication
27th December 2020

INTRODUCTION

Meconium aspiration syndrome is defined as a condition in newborns having either history of birth in meconium stained amniotic fluid or staining of umbilical cord, finger nails or vernix caseosa,

presenting with respiratory distress in first 24 hours of life with or without x-ray changes. Respiratory distress is defined as respiratory rate more than 60 breaths/min, or increased work of breathing i.e. having any 2 of the following; intercostal or subcostal in-drawing, sternal

retraction, nasal flaring or increased antero-posterior diameter of the chest. Abnormal Chest x-ray findings means diffuse or local, linear, patchy infiltrates or consolidation. Meconium aspiration syndrome (MAS) occurs after the aspiration of amniotic fluid containing meconium. Meconium aspiration can occur before or after birth. Meconium is the first intestinal discharge passed by newborns. It can be passed due to intrauterine distress, placental insufficiency, and maternal hypertension. Meconium aspiration causes airway obstruction, deficiency of surfactant, pulmonary hypertension and pneumonia leading to hypoxia.¹

In a meta-analysis neither surfactant lung lavage (SLS) nor bolus surfactant (BS) reduced the risk of mortality in neonates with MAS (relative risk (RR) 0.38, 95% confidence interval (CI) 0.09 to 1.57; and RR 0.80, 95% CI 0.39 to 1.66, respectively). Both SLL and BS reduced the duration of hospital stay (mean difference -2.0, 95% CI -3.66 to -0.34; and RR -4.68, 95% CI -7.11 to -2.24 days, respectively).¹⁹ The case-fatality rate in ventilated infants with MAS varies widely in published series (0-37%).²

The aim of this study was to determine the outcome of MAS in our population.

MATERIAL AND METHODS

It was a descriptive case series study done by non-probability consecutive technique from (6 months) 1st November 2018 to 30th April 2019 at Pediatric Department of Liaquat University, Hyderabad. Our study was done at a public sector hospital and we wanted to see whether mortality rate was similar as compared to private sector hospital or different. Sample size was calculated by using WHO sample size calculator, taking prevalence of mortality 14%,³ margin of error 5%, confidence level 95%, sample size was 186. Neonates with gestational age 35-42 weeks, (assessed by either last menstrual period or maternal ultrasound), birth-weight 2.0-4 kilograms, of either gender having history of meconium stained liquor or meconium staining of umbilical cord, finger nails and vernix caseosa on clinical examination or both presenting within first 24 hours of birth were included the study. Neonates having congenital heart disease, congenital lung anomalies, or distress due to any other cause

which could not be explained due to meconium aspiration syndrome were excluded from the study.

Neonates with history of birth with meconium stained liquor or meconium staining on examination presenting to neonatal emergency or OPD within 24 hours of birth were considered. Those with respiratory distress were admitted others were observed for 1 hour for signs of respiratory distress. If at the end of 1 hour, no sign of distress was noted, follow up was done at 12 hours of age and then at 24 hours of age. Lost to follow-up bias was controlled with the help of large sample size. At each follow-up signs of distress were noted. Those who developed respiratory distress were admitted. Informed consent to participate in the study was taken from the parents of the patient. History and physical examination were carried out. Those meeting the inclusion criteria were included in the final analysis. Age, gender, weight, length, gestational age, mode of delivery, place of delivery, development of MAS and outcome (MAS, respiratory distress at 0 hour, x-ray changes and mortality) were noted. Gestational age was determined by maternal records of either last menstrual period or last antenatal ultrasound and mode and place of delivery by maternal records. Blood CP and chest x-ray were performed at the time of admission. Weight and height were plotted on the standard growth charts to determine the centiles. Data was collected on prescribed proforma.

Data was entered and analyzed by using SPSS version 20. Mean and standard deviation was calculated for quantitative variables like age, weight, height, gestational age and BMI of mother. Frequency and percentage was calculated for qualitative variables like presence or absence MAS, gender, mode of delivery, place of delivery, and patients' outcome (respiratory distress, mortality and x-ray changes). Effect modifiers such as age, maternal age, gestational age, BMI of mother, weight and gender of baby, mode and place of delivery were controlled through stratification. Post-stratification, chi square was applied by taking significant p is equal to less than 0.05.

RESULTS

186 patients having history of birth in meconium stained amniotic fluid (MSAF) or meconium staining of umbilical cord were included in this study. Average age, weight and length of the baby as well as mean gestational age and BMI of the women were also reported (table 1). Male and female ratio of the baby was 1:1 as presented in table 1. Spontaneous vaginal delivery was observed in 105 (56.45%) and cesarean section in 81 (43.55%) babies as shown in table 1. Place of delivery is also presented in table 1.

Regarding of meconium aspiration syndrome in neonates, respiratory distress at 0 hour was seen in 86.4% (114 of 118), abnormal x-ray changes occurred in 67.4% (89 of 94) and death occurred in 34.8% (46 of 62) (table 2). Frequency of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid admitted at neonatal intensive care unit was 70.97% (132/186) cases as presented in table 3.

TABLE 1: Demographic characteristics

Variables	Mean	Std. Deviation
Age (hours)	9.47	8.41
Weigh (kg)	2.98	0.35
Length (cm)	51.36	2.65
Gestational age (weeks)	37.67	1.16
BMI of mother (kg/m ²)	19.89	2.29
Gender	N	%
Male	93	50
Female	93	50
Mode of delivery		
Spontaneous	105	45%
C/Section	81	43.55%
Place of delivery		
Hospital	96	51.81
Maternity home	61	32.80
Clinic	29	15.59
Meconium Aspiration		
Yes	132	70.97

TABLE 2: Outcome of meconium aspiration syndrome (n= 186)

Outcome	Meconium Aspiration Syndrome		Total (%)	P-Value
	Yes n=132 (%)	No n=54 (%)		
Respiratory distress at 0 hour	114 (86.4)	4 (7.4)	118 (63.4)	0.0005
X-ray changes present	89 (67.4)	5 (9.3)	94 (50.5)	0.0005
Mortality	46 (34.8)	16 (29.6)	62 (33.3)	0.493

Rate of MAS was observed with respect to baby's age and found significantly high ($p=0.0005$) in newborns of age less than 12 hours as shown in table 3. Similarly it was also statistically significant with gestational age, BMI of the mother, weight of the baby and mode of delivery (table 3) while it was not significant with gender of the baby and place of delivery (table 3).

Outcome of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid admitted at neonatal intensive care were also stratified with respect to baby age, gestational age, BMI of the mother, weight of the baby, mode of delivery, gender of the baby and place of delivery. It was observed that respiratory distress at 0 hour and abnormal x-ray changes were

significantly high in MAS as compared to non-MAS for all stratified age of the baby, gestational age and BMI of the mother while rate of mortality was not significant in these stratified groups (table 4). Respiratory distress at 0 hour, abnormal x-ray changes and mortality was significantly high with MAS for weight of the baby, gender of baby (table 4). Respiratory distress at 0 hour was significantly associated with abnormal x-ray changes while it was not associated with mortality as shown in table 4. Respiratory distress at 0 hour, abnormal x-ray changes and mortality were significantly high in MAS (table 4). Outcome was also observed with respect to place of delivery and presented in table 4.

TABLE 3: Frequency of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid (n= 186)

Age of baby	Meconium Aspiration Syndrome		Total	p-Value
	Yes	No		
≤1 hours	48 (85.7%)	4 (14.3%)	56	0.0005
2-6hours	29 (78.4%)	8 (21.6%)	37	
7-12hours	23 (65.7%)	12 (34.3%)	35	
13-18hours	9 (37.5%)	15 (62.5%)	24	
19-24hours	23 (67.7%)	11 (32.4%)	34	
Gestational age (weeks)				
≤ 37 Weeks	53 (60.9%)	34 (39.1%)	87	0.005
38-42 weeks	79 (79.8%)	20 (29.0%)	99	
BMI of Mothers				
≤ 18 kg/m ²	32 (86.5%)	5 (13.5%)	37	0.020

18.1 to 28 kg/m ²	100 (67.1%)	49 (32.6%)	149	
Weight of the baby				
≤ 3.1kg	72 (62.1%)	44 (37.9%)	116	0.001
>3.1kg	60 (85.7%)	10 (14.3%)	70	
Mode of delivery				
Spontaneous	66 (62.9%)	39 (37.1%)	105	0.006
Vaginal Delivery	66 (81.5%)	15 (18.5%)	81	
Cesarean Section	66 (73.1%)	25 (26.9%)	93	0.518
Male	64(68.8%)	29 (31.2%)	93	
Female	67 (69.8%)	29 (30.2%)	96	0.838
Place of Delivery				
Hospital	45 (73.8%)	16 (26.2%)	61	
Maternity Home	20 (69.0%)	9 (31.0%)	29	
Private Clinic				

TABLE 4a: Outcome of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid admitted at neonatal intensive care unit

Outcome (n=186)	Meconium Aspiration Syndrome		p-value
	Yes	No	
For ≤12 Hours Baby	n=100 (%)	n=28 (%)	
Respiratory distress at 0 hour	92 (92.0)	4 (14.3)	0.0005
X-ray changes	70 (70.0)	3 (10.7)	0.0005
Mortality	26 (26.0)	4 (14.3)	0.196
For >12 Hours Baby	n=32	n=26	p-value
Respiratory distress at 0 hour	22 (68.8)	0 (0.0)	0.0005
X-ray changes	19 (59.4)	2 (7.7)	0.0005
Mortality	20 (62.5)	12 (46.2)	0.213
For ≤37 Weeks Gestation	n=53	n=34	p-value
Respiratory distress at 0 hour	48 (90.6)	0 (0.0)	0.0005
x-ray changes	30 (56.5)	5 (14.7)	0.0005
Mortality	26 (49.1)	12 (35.3)	0.207
for 38 to 42 weeks gestation	n=53	n=34	p-value
Respiratory distress at 0 hour	66 (83.5)	4 (20.0)	0.0005
x-ray changes	59 (74.7)	0 (0.0)	0.0005
Mortality	20 (25.3)	4 (20.0)	0.620
For BMI ≤ 18 kg/m²	n=32	n=5	p-value
Respiratory distress at 0 hour	31 (96.9)	2 (40.0)	0.0005
x-ray changes	21 (65.6)	0 (0.0)	0.006
Mortality	11 (34.4)	0 (0.0)	0.118
For BMI 18.1 to 28 kg/m²	n=100	n=49	p-value
Respiratory distress at 0 hour	83 (83.0)	2 (4.1)	0.0005
X-ray changes	68 (68.0)	5 (10.2)	0.0005
Mortality	35 (35.0)	16 (32.7)	0.777
For Baby Weight ≤3.1kg	n=72	n=44	p-value
Respiratory distress at 0 hour	61 (84.7)	2 (4.5)	0.0005

X-ray changes	46 (63.9)	5 (11.4)	0.0005
Mortality	29 (40.3)	16 (36.4)	0.675
For Baby Weight >3.1kg	n=60	n=10	p-value
Respiratory distress at 0 hour	53 (88.3)	2 (20.0)	0.0005
X-ray changes	43 (71.7)	0 (0.0)	0.0005
Mortality	17 (28.3)	0 (0.0)	0.050

TABLE 4b: Outcome of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid admitted at neonatal intensive care unit

Outcome (n=186)	Meconium Aspiration Syndrome		p-Value
	Yes	No	
For Male	n=68 (%)	n=25 (%)	
Respiratory distress at 0 hour	55 (80.9)	0 (0.0)	0.0005
X-ray changes	49 (72.1)	5 (20.0)	0.0005
Mortality	27 (39.7)	0 (0.0)	0.0005
For Female	n=64	n=29	p-value
Respiratory distress at 0 hour	59 (92.2)	4 (13.8)	0.0005
X-ray changes	40 (62.5)	0 (0.0)	0.0005
Mortality	19 (29.7)	16 (55.2)	0.019
For SVD	n=66	n=39	p-value
Respiratory distress at 0 hour	57 (86.4)	4 (10.3)	0.0005
X-ray changes	46 (69.7)	3 (7.7)	0.0005
Mortality	28 (42.4)	16 (41)	0.888
For Caesarean Section	n=66	n=15	p-value
Respiratory distress at 0 hour	57 (86.4)	0 (0.0)	0.0005
X-ray changes	43 (65.2)	1 (13.3)	0.0005
Mortality	18 (27.3)	0 (0.0)	0.022
For Lique University Hospital	n=67	n=29	p-value
Respiratory distress at 0 hour	61 (91.0)	0 (0.0)	0.0005
X-ray changes	42 (62.7)	0 (0.0)	0.0005
Mortality	15 (22.4)	16 (55.2)	0.002
For Maternity Home	n=45	n=16	p-value
Respiratory distress at 0 hour	34 (75.6)	2 (12.5)	0.0005
X-ray changes	30 (66.7)	4 (25.0)	0.004
Mortality	27 (60.0)	0 (0.0)	0.0005
For Private Clinic	n=20	n=9	p-value
Respiratory distress at 0 hour	19 (95.0)	2 (22.2)	0.0005
X-ray changes	17 (85.0)	1 (11.1)	0.0005
Mortality	4 (20.0)	0 (0.0)	148

DISCUSSION

This study was conducted to determine the outcome of meconium aspiration syndrome in neonates born in meconium stained amniotic fluid, there were 186 neonates having history of birth in MSAF or meconium staining of umbilical cord. There are 3 grades of meconium stained liquor. In Grade 1 there is light meconium staining of amniotic fluid. Liquor is slight greenish or yellowish tinge. It is usually not related to fetal distress and usually not causes meconium aspiration syndrome (MAS). In Grade 2 there is moderate meconium staining of liquor. Liquor look like khaki green or brownish in color. It is possible

sign of fetal distress but fetal distress is confirmed if it is associated with abnormal FHR. When it is present in early labor can be more of concern because baby can inhale it and risk of MAS. In Grade 3 there is heavy or thick meconium stained liquor. Liquor look like pea soup, thick green or black in color. Thick meconium is a sign of fetal distress. In this risk of MAS is very high.

Surfactant is well recognized therapy in case of MAS. If used, bolus surfactant should be administered as early as possible to infants who exhibit significant parenchymal disease, at a phospholipid dose of at least 100 mg/kg, rapidly instilled into the trachea. Current evidence

supports the use of bolus surfactant therapy on a case by case basis in nurseries with a relatively high mortality associated with MAS, or the lack of availability of other forms of respiratory support such as high-frequency ventilation or nitric oxide⁴.

Meconium can be aspirated before, during or after birth. It occurs in term or post-term neonates. Meconium aspiration can lead to respiratory distress, respiratory failure and pulmonary hypertension. Although there are lot of advancement in medical technology but still meconium aspiration is big concern for pediatricians and obstetricians. Meconium stained amniotic fluid is present in about 7-22% deliveries.⁵ Among them MAS occurs in 5% of cases. The mortality rate due to MAS is about 0.05% (i.e. 1 in 2000 of all pregnancies).⁶ In Pakistan neonatal mortality rate is 49 per 1000 live births⁷ and this ranks third among most common countries where neonatal mortality is high.⁸

International data shows that, meconium stained liquor is present in 8-25% of deliveries, among them about 10% of newborns develops meconium aspiration syndrome (MAS).⁹ The prevalence of meconium aspiration syndrome in India is (10.1% to 19.09%),^{10,11} The frequency of meconium aspiration syndrome in Pakistan is about 17.4% 5. Mortality from MAS is also very high, that is about 14% to 32%.^{12,13}

The chances of MAS is higher in more gestational ages, the incidence increases as the gestational age advances like at 37, 40, and >42 weeks being 3%, 13%, and 18% respectively.¹⁴ In our study the mean gestational age was 37.67 weeks, MAS was found 60.9% in ≤37 Weeks and 79.8% in 38-42 weeks of gestational age. Similar finding were observed in study by Desai et al.¹⁵ In a local study, the MAS was present in 13 patients (14.9%)¹⁶ while in our study it was found in 70.97% cases. The low prevalence of meconium aspiration in their study may be because that study was conducted at a private sector hospital having well equipped neonatal unit and every delivery was done in the presence of pediatrician.

In a local study meconium aspiration was noted in 102(68%) males and 48(32%) patients were female,¹⁷ unsimilar to this Male and female ratio was 1:1 in our study. As obstetricians are more

vigilant in case of meconium stained liquor, that is why cesarean section rate is higher, which was statically significant in our study, more number of women with MAS underwent cesarean section (81.5%). Our findings are similar to the study by Kumar S et al,¹⁴ in which cesarean section done in 72% cases.

In our study, regarding meconium aspiration syndrome in neonates, respiratory distress at 0 hour was 86.4% (114 of 118), and abnormal x-ray changes occurred in 67.4% (89 of 94) and death occurred in 34.8% (46 of 62) neonates. Nath et al in their study reported respiratory distress at 0 hour found in (n=18) 31.03% of cases with severe birth asphyxia.¹⁸ In a cross-sectional study, it was found that a significantly higher incidence of respiratory distress at 0 hour for babies born through MSAF, compared with babies born with clear amniotic fluid. In an Indian study mortality rate was 26%, oxygen requirement at birth was the independent predictors of mortality.¹⁹ A similar study done in the same city i.e. Hyderabad in private sector hospital showed that the mortality was 0%.²⁰ Another study conducted at a public sector hospital of Lahore showed mortality rate of 19.44%.²¹

CONCLUSION

In this study significant number of neonates aspirated meconium after passing in the amniotic fluid and developed respiratory distress soon after birth. Death ratio was higher due to unavailability of ventilator support.

Grant support & financial disclosures: None

Conflict of interest: None

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