

Original Research Article

Meconium-stained amniotic fluid as a risk factor for perinatal asphyxia

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ABSTRACT

Background: The aim of this study was to find out immediate fetal outcome in meconium-stained amniotic fluid in relation to perinatal asphyxia.

Methods: This retrospective study includes medical records of all neonates admitted to Neonatal Intensive Care Unit (NICU) between December 2016 and July 2018. The variables reviewed are age, sex, weight, mode of delivery, gestational age, presence of meconium aspiration syndrome (MAS) and perinatal asphyxia.

Results: Out of 408 total admissions in NICU, 69.1% were male babies and remaining 30.9% were female babies. In the study out of 36 subjects with Perinatal Asphyxia, 38.9% had MAS and 61.1% had not MAS. Out of 372 subjects without perinatal asphyxia, 93.8% had no MAS and 6.2% had MAS. There was significant association between MAS and perinatal asphyxia. Odds ratio was 9.656. i.e. those with MAS had 9.656 times higher risk for perinatal asphyxia.

Conclusions: The management of MAS, which is a perinatal problem, requires a well concerted and coordinated action by the obstetrician and pediatrician. Prompt and efficient delivery room management can minimize the sequelae of aspirated meconium and decrease the chance of perinatal asphyxia in the new born babies.

Keywords: Meconium aspiration syndrome, Neonatal intensive care unit, Perinatal asphyxia

INTRODUCTION

In early 2000, the prevalence of meconium aspiration syndrome (MAS) ranged from 0.20% to 0.54% in the general population and from 1.0% to 6.8% in infants born through meconium-stained amniotic fluid (MSAF).¹⁻⁴ In a 8 years span from 1990 to 1998, a total of ten reports were reviewed that showed a total incidence of 0.52% of MAS, 13.1% of MSAF 4.2% of MAS among MSAF and 49.7% of MAS needing ventilator support with a 4.6% mortality rate.³ Meconium aspiration syndrome (MAS) accounts for 28 to 40 per cent of neonatal mortality.^{1,3}

Among all live births approximately 13% neonates are born through meconium-stained amniotic fluid and out of these 5-10% developed MAS, which increases neonatal morbidity and mortality. Following the first description

of the pathophysiology of MAS in 1975, there has been a marked improvement in the survival of infants with MAS due to improved intra- and post-partum management of the same.⁵ Although there is a significant decrease in the occurrence of MAS and associated mortality in developed countries MAS remains a major problem in developing countries.

Meconium is derived from the Greek word "mekoni," meaning poppy juice or opium. It is a sterile, thick, black-green (resulting from bile pigments), odorless material first observed in the fetal intestine during the 3rd month of gestation which is the fecal material that accumulates in the fetal colon throughout gestation. It consists of an accumulation of debris, comprising desquamated cells from the intestine and skin, gastrointestinal mucin, lanugo hair, fatty material from the vernix caseosa,

amniotic fluid, and intestinal secretions.^{6,7} Most infants have their first bowel movement after birth (within the first 24-48 h after birth). Occasionally, a fetus can pass meconium in utero. MAS refers to the aspiration of meconium and amniotic fluid by the fetus. This can occur when the fetus is still in the uterus, passing through the birth canal or when it takes its first breath after birth. MAS is an important cause of respiratory distress in the term newborn, is a serious condition with high morbidity and mortality.⁸ MAS has a complex pathophysiology and occurs due to a combination of airway obstruction, pulmonary hypertension, epithelial injury, surfactant inactivation, and inflammation, when there is underlying, fetal asphyxia and infection. An inflammatory response to meconium is seen in both newborns and animal models with MAS.⁸⁻¹³ Intratracheal instillation of meconium in animals results in an intense pulmonary inflammatory reaction with the influx of polymorphonuclear leukocytes, monocytes/macrophages, and T-cells within a few hours. Parenchymal lung cell injury is worsened by the production of proinflammatory cytokines and apoptotic epithelial cells are present in meconium containing lungs.¹⁴⁻¹⁷

MAS results in considerable respiratory morbidity in term and near-term infants. It is clinically characterized by early onset of respiratory distress in an infant born through MSAF presenting with poor lung compliance and hypoxemia. Chest X-ray shows patchy opacification and hyperinflation.^{18,19} Mechanical ventilation and intubation is required among one-third of infants suffering from MAS.^{20,21} Newer neonatal therapies include high-frequency ventilation, inhaled nitric oxide, and surfactant.^{22,23}

This study was undertaken to find out immediate fetal outcome in meconium-stained liquor in relation to perinatal asphyxia.

METHODS

This hospital-based retrospective observational study was conducted in the Department of Pediatrics in

Rajarajeswari Medical College and Hospital, Bengaluru. The study population included patients admitted to Neonatal Intensive Care Unit (NICU). Data were collected from the medical record department of the patients of NICU. The variables collected were age, sex, weight, mode of delivery and GA.

Outcome variables: MAS, perinatal asphyxia, and other neonatal infections.

Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer’s exact test (for 2x2 tables only) was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation.

Graphical representation of data: MS Excel and MS word were used to obtain various types of graphs such as bar diagram, Pie diagram.

p value (probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS

In the study 63.8% were males and 36.1% were females (Table 1).

Table 1: Gender distribution of subjects.

		No. of babies	%
Sex	Male	23	63.8
	Female	13	36.1

Table 2: Association between perinatal asphyxia and gender.

		Perinatal asphyxia				Total	P value	OR (CI)
		Present		Absent				
		Count	%	Count	%			
Gender	Male	23	63.9	257	69.1	280	0.5211	0.7917 (0.3874, 1.618)
	Female	13	36.1	115	30.9			
	Total	36		372				

In the study out of 36 subjects with perinatal asphyxia, 63.9% were male and 36.1% were females. Out of 372 subjects without perinatal asphyxia, 69.1% were males and 30.9% were females. There was no significant

association between gender and perinatal asphyxia (Table 2). In the study out of 36 subjects with Perinatal Asphyxia, 38.9% had MAS and 61.1% had not MAS. Out of 372 subjects without perinatal asphyxia, 93.8% had no

MAS and 6.2% had MAS. There was significant association between MAS and perinatal asphyxia. Odds

ratio was 9.656. i.e. those with MAS had 9.656 times higher risk for Perinatal asphyxia.

Table 3: Association between perinatal asphyxia and MAS.

		Perinatal asphyxia				Total	P value	OR (CI)
		Present		Absent				
		Count	%	Count	%			
MAS	Present	14	38.9%	23	6.2%	37	<0.001*	9.656 (4.374, 21.31)
	Absent	22	61.1%	349	93.8%			
	Total	36		372				
						408		

*Statistically significant

Thus, from the results of this study a strong relationship between MAS and perinatal asphyxia can be established, i.e., meconium aspirated neonates are more prone for developing perinatal asphyxia.

DISCUSSION

The increased risk for pulmonary morbidity and mortality among infants born through MSAF is well recognized. Although many reports have noted a clinical spectrum of pulmonary dysfunction from mild tachypnea to severe pulmonary insufficiency, this study also confirms that MSAF is associated with an increased risk for pulmonary dysfunction.

The risk for pulmonary disease, however, is not manifested equally in all infants with meconium staining. As it was shown by several previous studies, the greatest risk for pulmonary disease occurred among infants with associated signs of possible intrapartum fetal compromise. Despite following recommended guidelines of airway management, these infants continued to manifest a high rate of pulmonary morbidity.²⁴⁻²⁶

The recommendation by the American Academy of Pediatrics in 1983 did not suggest that all infants born through thick MSAF necessarily require tracheal suction.

The second edition of these guidelines noted the absence of additional studies to support or refute the practice of tracheal suction for MSAF and recommended that "in the presence of thick or particulate meconium, the larynx should be visualized, and if meconium is present, the clinician should intubate the trachea and apply suction."

The most recent edition of the guidelines published in 1992, is less dogmatic and recommended that depressed infants with meconium in the hypopharynx to have tracheal suction. However, it is further noted that cord visualization and tracheal suction in the vigorous infant with thick meconium may not be necessary. None of the Guidelines have recommended tracheal suction of infants born through thin MSAF.^{24,25}

Meconium aspiration syndrome with sex

MSAF neonates were found in 78 (9.79%) out of 796 deliveries (live birth) with a male:female ratio 1:1:1.²⁷ In this study, male (63.9%) showed preponderance as compared to female (30.9%), among which (6.2%) were cases of MAS.

Perinatal asphyxia with sex

In numerous studies, asphyxia was more prevalent in male than female.²⁸⁻³¹ In this study, male preponderance is seen. Out of 408 cases, perinatal asphyxia was present in 63.9% males and 36.1% in females making males are prone than females for perinatal asphyxia.

CONCLUSION

The present study showed that MAS as an important risk factor for perinatal asphyxia in term babies making perinatal asphyxia more common among MAS babies.

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

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