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ORIGINAL ARTICLE

A PROSPECTIVE STUDY OF MECONIUM ASPIRATION SYNDROME IN NEWBORNS IN A DISTRICT HOSPITAL IN SOUTHERN INDIA

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ABSTRACT: AIM OF THE STUDY: 1. To study the incidence and risk factors of MAS in neonates, 2. To study the outcome of using appropriate respiratory support (CPAP and mechanical ventilation) in neonates with MAS and 3. To find the MAS related mortality rates. **MATERIALS AND METHODS:** The present study was a single centre, descriptive, prospective and observational cross sectional study, done over a period of one year from 1st of May 2014 to 30th of April 2015. Only inborn cases with history of birth through MSAF were included. Gestational age, birth weight, type of meconium, Apgar score at 1min and 5 min, duration of requirement of O2, CPAP, SIMV and number of deaths were recorded and analysed further. **RESULTS:** The study was performed over a period of 12 months from May 2014 to April 2015. During the study period, total number of deliveries in the district hospital was 9934. Total number of live births and still births were 9697 and 237 respectively. Total NICU admissions were 2237. Total MSAF cases were 563(5.67% of total deliveries). Total MAS cases were 220(2.21% of total deliveries and 39.08% of total MSAF cases). Percentage of MAS cases on ventilatory support was 35.45% (78/220, 0.19% of total number of deliveries). Total MAS related deaths were 19(8.64% of total MAS cases). **CONCLUSION:** The incidence of MAS was 2.21% of total deliveries. Post maturity, low Apgar scores and thick MSAF were the risk factors associated with severe MAS and high mortality rate. Using appropriate respiratory support in severe MAS cases had shown low mortality rate. The Mortality rate of MAS was 8.64%.

KEYWORDS: Meconium aspiration syndrome, Oxygen, CPAP, SIMV, Risk factors, Mortality.

INTRODUCTION: Meconium aspiration syndrome (MAS) is a complex syndrome that ranges in severity from mild respiratory distress to severe respiratory failure, persistent pulmonary hypertension of the newborn and sometimes death.(1) MAS is an infrequent but life-threatening respiratory disease affecting some of the infants born through meconium-stained amniotic fluid (MSAF). MAS may be a severe condition as 30 to 50% of MAS required mechanical ventilation or continuous positive airway pressure (CPAP).(1,2)

MAS is frequently associated with fetal hypoxia which promotes meconium discharge in amniotic fluid, gasping and aspiration of MSAF, and also changes in the vascular muscular media of pulmonary arteries of the fetus.(3,4) MSAF is found in 7 to 20% of pregnancies at the time of delivery.(5,6,7)

Recently, Bhutani et al.(8) suggested a system-based strategy comprising the prenatal, natal and postnatal management of babies delivered through MASF, so that the adverse outcomes are minimized and the least number of babies require innovative ventilatory support.

Very few studies have been done on ventilated MAS babies in Government District Hospitals. Our center had become level III facility in recent years. So this study would help to study the outcome of severe MAS in terms of preventing mortality and morbidity by using appropriate ventilatory

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support. The present study would also quantify the burden of MAS, both on health personnel and governing authority to consider for adequate equipment and additional health personnel.

AIM OF THE STUDY:

1. To study the incidence and risk factors of MAS in neonates.
2. To study the outcome of using appropriate respiratory support (CPAP and mechanical ventilation) in neonates with MAS.
3. To find the MAS related mortality rates.

MATERIALS AND METHODS: Study Design: The present study was a single center, descriptive, prospective and observational cross sectional study.

Sample Size: Over a span of 1 year from May 2014 to April 2015, 563 babies were included who had history of birth through MSAF.

Method of Collection of Data: The data for the purpose of the study was collected in a predesigned and pretested proforma which included various parameters like gestational age, birth weight, Apgar score, type of meconium, mode of respiratory support used, complications and mortality.

Inclusion Criteria:

1. Patients fulfilling all the diagnostic criteria of MAS.
2. All inborn babies.

Exclusion Criteria:

1. All Out born cases.
2. Congenital malformations,

The present study was a single centre, descriptive, prospective and observational cross sectional study, done over a period of one year from 1st of May 2014 to 30th of April. Only inborn cases with history of birth through MSAF were included. Cases were divided as thin, moderate and thick MSAF. Gestational age, birth weight, Apgar score at 1min and 5 min, duration of requirement of O2, CPAP, SIMV and number of deaths were recorded. Eight cases were discharged against medical advice and lost for follow up, so not included for the study.

The diagnosis of MAS was established according to diagnostic criteria from Rubaltelli et al.[9] that is:

a. Respiratory distress with elevated oxygen dependence;
b. Presence of meconium in amniotic fluid; and
c. Chest radiograms with massive bilateral patchy infiltrates with or without pleural fluid.

In the present study, 11 cases of severe MAS requiring ventilatory support could not be ventilated because of non-availability of ventilators during that time and non-willingness of parents to take the baby elsewhere due to financial constraints. So in the present study along with study of incidence, risk factors and mortality of MAS, the outcome of using appropriate ventilatory support could be studied.

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RESULTS: The study was performed over a period of 12 months from May 2014 to April 2015. During the study period, total number of deliveries in the district hospital was 9934. Total number of live births and still births were 9697 and 237 respectively. Total NICU admissions were 2237(26.07% of total live births). Total MSAF cases were 563(25.17% of total NICU admissions and 5.67% of total deliveries). Thin MSAF cases were 241, moderate MSAF cases were 213 and thick MSAF cases were 109. In the present study, 39.08% of babies (220/563) with MSAF sustained MAS. Total MAS related deaths were 19(8.64% of total MAS cases and 7.98% of total NICU deaths). MAS related statistical data is shown in table 1.

		Percentage in Relation to Total number of Deliveries (n=9934)
Total number of deliveries	9934	100
Total number of live births	9697	97.61
Total number of still births	237	2.39
Total NICU admissions	2237	22.52
Total MSAF admissions	563	5.67
Total cases of MAS	220	2.21
Total number of MAS cases on ventilatory support	78	0.19
Total MAS related deaths	19	0.79

Table 1: MAS related statistical data

Risk factors associated with MAS and Severe MAS like post maturity, Low Apgar scores and type of meconium were analysed in detail in the present study (Table 2).

			Percentage	**Number of Severe MAS Requiring Ventilatory Support**	**Percentage**	**Number of Deaths**	**Percentage**
Gestational age	Term	116	52.73	41	46.07	11	57.89
	Post term	104	47.27	48	53.93	8	42.11
Apgar score	Low@	62	28.18	51	57.3	13	68.42
	Normal	158	71.82	38	42.7	6	31.58
Type of meconium#	Thin	11	5.0	2	2.25	1	5.26
	Moderate	96	43.64	26	29.21	5	26.32
	Thick	113	51.36	61	68.54	13	68.42

Table 2 MAS related risk factors **(**n=220)

@ ≤3 at 1 minute of age. # for each patient, the type of MSAF was qualified as “thin” when the fluid was just tinted yellowish or slightly greenish, “moderate” when it was really greenish, but fluid and “thick” when it was green and thick.

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In the present study, 35.45% of babies (78/220) with MAS needed ventilatory support (0.19% of total number of deliveries). Details of modes of respiratory supports used in newborns with MAS are shown in table 3.

Type of Respiratory Support	Number of Cases (n=220)	Percentage	Number of Deaths
Oxygen	142	64.55	12
CPAP	31	14.09	1
SIMV	47	21.36	6
Total	220	100	19@

Table 3: Modes of respiratory support in newborns with MAS n=220

@ 8 deaths due to severe MAS itself and 11 deaths due to not giving timely ventilatory support because of non-availability of ventilators and non-willingness of parents to take the newborn elsewhere due to financial constraints.

DISCUSSION: In the early 2000, the prevalence of MAS ranged from 0.20% to 0.54% in the general population.[10,11] and from 1.0% to 6.8% in infants born through MSAF.[3,10,11] A review of ten reports published from 1990 to 1998 showed a combined incidence of 13.1% for MSAF, 0.52% of MAS, 4.2% of MAS among MSAF, and 49.7% of MAS requiring ventilatory support with a 4.6% mortality rate .[11] Wiswell TE et al[12] stated that approximately 8 to 19% of all term deliveries occurred through MSAF and MAS developed in 5 to 33% of those infants. Incidence of MAS in the present study was similar to that of Wiswell TE et al.[12]

Respiratory complications of MAS were often the consequence of hypoxia in utero with significant acidosis and depressed respirations at birth. There also appears to be a greater risk of developing MAS as well as all respiratory complications (that is, tachypnea, pneumonia, pulmonary air leaks) if the meconium is 'thick' as opposed to 'thin'.[13]

Previous studies identified several risk factors of MAS that is, fetal compromise indicated by abnormalities of fetal heart rate tracings and/or poor Apgar score [2] and/or low cord pH [10]; Caesarean delivery [2]; ethnicity (black Americans, Africans, Pacific Islanders); advanced gestation.[14] Infants who are vigorous at birth have a very low risk of developing MAS.[15] Those who develop MAS are often greater than 41 weeks gestation and have clinical signs of post maturity (decreased subcutaneous tissue, peeling skin, long nails and so on). MSAF is associated with fetal acidosis, abnormalities in FHRs and low Apgar scores, suggesting hypoxia as the stimulant of passage of meconium in utero.[16] In accordance with the previous studies post maturity, thick meconium and low Apgar scores were the risk factors of MAS in the present study.

Bhutani et al[8] stated that approximately 30 to 50% of infants diagnosed with MAS would require CPAP or mechanical ventilation. Despite multiple therapies for this syndrome, there was a disturbingly high-mortality rate (4 to 19%) historically. However, in the most recent of these reviews, only 20% of 40 infants with MAS requiring positive pressure assistance needed 'innovative ventilatory support' (defined as the use of high-frequency ventilation (HFV), inhaled nitric oxide or surfactant) and no infants died or required extracorporeal membrane oxygenation. As shown by Bhutani et al.[8] at Pennsylvania Hospital over a period of 6 years, the use of a systems-based strategy

for babies delivered through MSAF can minimize adverse outcomes. This review showed that conventional respiratory therapies such as oxygen, CPAP and CMV were adequate treatment for 80% of MAS-affected infants with no infant requiring extracorporeal membrane oxygenation or dying from the disease. Chaturvedi P et al[7] had mentioned that the MAS had occurred in 2 to 9% of neonates born through MASF and has a high mortality rate of 40%. The mortality and rate of requirement of ventilatory support in the present study were similar to the previous studies.

CONCLUSION: The incidence of MAS was 2.21% of total deliveries. Post maturity, low Apgar scores and thick MSAF were the risk factors associated with severe MAS and high mortality rate. Using appropriate respiratory support in severe MAS cases had shown low mortality rate. The Mortality rate of MAS was 8.64%. Since the present study was done in a government district hospital, where all high risk pregnancies were referred, incidence and mortality rates would be spuriously high. Therefore, a population-based study should be designed.

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