MECONIUM-STAINED AMNIOTIC FLUID AND MECONIUM ASPIRATION SYNDROME- A STUDY ON RISK FACTORS AND NEONATAL OUTCOME

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ABSTRACT

BACKGROUND

Meconium is the first faeces of a newborn. Meconium-stained amniotic fluid (MSAF) occurs in about 7-22% of live births and is regarded as a sign of foetal compromise. Meconium aspiration syndrome (MAS) is a serious and potentially preventable condition with risk factors like post-dated pregnancy, small for gestational age, oligohydramnios, hypertensive disorder of pregnancy, gestational diabetes, and maternal drug abuse. Hence, the present study was conducted to find out the rate of MAS, analyse associated maternal and neonatal risk factors and final outcome in babies born through MSAF in a tertiary health care facility.

Objectives- 1. To find out the rate of Meconium aspiration syndrome (MAS) in babies born with Meconium-stained amniotic fluid (MSAF) in a tertiary health care facility, GGH, Guntur. 2. To analyse the associated maternal and neonatal risk factors associated with Meconium aspiration syndrome (MAS). 3. To evaluate the outcome of Meconium aspiration syndrome (MAS).

MATERIALS AND METHODS

A prospective, hospital based, observational study was carried out among 160 babies born with MSAF admitted to the NICU in a tertiary health care setting in the Department of Paediatrics, during a period of 5 months. Patient details were recorded in a predesigned semi-structured proforma. Informed written consent was taken from parents of babies. MAS was designated in a baby as per the defined criteria. Their risk factors and outcomes were analysed by using SPSS Software 18 version. Institutional ethics committee approval was obtained.

RESULTS

Out of the total 160 babies born with MSAF, 68 (42.5%) were female and 92 (57.5%) were male. MAS was seen in 21 (13.12%) babies. It was observed that there is significant association between MAS & MSAF and the following risk factors like Post maturity (1.25%), Small for Gestational Age (SGA) (11.25%), Oligohydramnios (4.38%) and low APGAR (5.62%). MAS babies who required ventilation (CPAP & IMV) were 9 (42.85%). The mortality observed in our study was 5 (23.80%), and the rest of the 16 MAS babies were discharged without any complications.

CONCLUSION

MSAF and MAS affect mostly full term and post-term babies. MAS has significant effect on neonatal outcome when it is associated with risk factors like post-term gestation, SGA, Oligohydramnios, APGAR score < 7. These babies required ventilator support, hence they require continuous and close monitoring in a tertiary care setting. MSAF and MAS can be prevented by appropriate antenatal and natal care by the obstetrician and neonatologist.

KEYWORDS

Meconium Aspiration Syndrome (MAS) Meconium-stained Amniotic Fluid (MSAF), Risk Factors Neonatal Outcome.

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BACKGROUND

Meconium is a sterile, thick, black green, odourless material that results from the accumulation of debris in the foetal intestine during the third month of gestation.[1] At times this can be passed before the baby is born, discolouring the amniotic fluid.[2] Meconium is passed following an asphyxial episode in utero.

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If the asphyxia episode is accompanied by prolonged gasping, meconium will be drawn deeply in to the lungs.[3] The passage of meconium into the amniotic fluid during labour is one of the traditional indicators of foetal distress which is associated with increased perinatal morbidity and mortality.[4]

Infants born through Meconium-stained amniotic fluid (MSAF) are more likely to develop respiratory distress compared to their counterparts born through clear amniotic fluid[5]. MSAF occurs in about 7-22% of live births. There are contradictory studies about the effect of MSAF on the obstetric outcome.[6]

Meconium aspiration syndrome (MAS) is a serious and potentially preventable condition occurring usually in term and post-term babies.[7] MAS is one of the most common causes of respiratory distress in term and post-term infants, which remains a major objective for obstetricians and neonatologists.[8]

According to National Neonatal Perinatal Database (NNPD), MAS was defined as Presence of Two of the following

a) Meconium staining of liquor or staining of nails or umbilical cord or skin.
b) Respiratory distress within one hour of birth.
c) Radiological evidence of aspiration pneumonitis (Atelectasis and/or hyperinflation).
d) Clinically MAS is usually defined as a respiratory dysfunction in an infant who is born with MSAF (i.e., visual observation of greenish fluid discolouration) and shows symptoms that cannot be otherwise explained.

Risk factors that may cause foetal distress which leads to MSAF include placental ageing due to post-dated pregnancy, IUGR, oligohydramnios, hypertensive disorder of pregnancy, gestational diabetes, & maternal drug abuse.[9] MSAF at delivery is a potential sign of foetal compromise. The presence of meconium is an indication for continuous monitoring of the foetal heart rate (FHR) during labour and it lowers the threshold for making a diagnosis of foetal distress if FHR abnormalities are present.[10] Unfortunately, there is no definitive test that confirms the clinical impression of meconium in amniotic fluid or on histopathological specimen. MAS causes significant respiratory distress because meconium is locally irritative, obstructive and a medium for bacterial growth. This study was conducted to find out the incidence of meconium aspiration syndrome, analyse associated maternal and neonatal risk factors and final outcome in babies born through Meconium-stained amniotic fluid in a tertiary health care setting.

Objectives

- To find out the rate of Meconium aspiration syndrome (MAS) in babies born with Meconium-stained amniotic fluid (MSAF) in GGH, Guntur.
- To analyse the associated maternal and neonatal risk factors associated with Meconium aspiration syndrome (MAS).
- To evaluate the outcome of Meconium aspiration syndrome (MAS).

MATERIALS AND METHODS

The study was a prospective, hospital based, observational study done in a tertiary health care setting in the Department of Paediatrics, Government General Hospital, attached to Guntur Medical College, Guntur, Central Andhra Pradesh, South India. During the study period (October 2015 to February 2016 (5 months), there were 2,380 live births, of which only 160 had (6.7%) MSAF. MAS developed in 21 of these infants (13.12%). Hence, the present study was conducted among 160 Neonates.

Inclusion Criteria

Neonates born with Meconium-stained amniotic fluid and/or meconium staining of nails/cord/skin that fulfilled the eligibility criteria of MAS were included in the study group. Those babies whose parents gave consent were included.

Exclusion Criteria

Babies born with prematurity and with congenital anomalies and whose parents didn't give consent were excluded from the study.

The study was approved by the institutional Ethics Committee. A written consent was obtained from either of the parents of the baby.

The data was recorded in a pre-designed proforma with all details including laboratory examination findings and was analysed using SPSS 18 version software.

RESULTS

A total of 2,380 live births occurred during the period of October 2015 to March 31st 2016. Only 160 (6.7%) had MSAF. MAS developed in 21 of these infants (13.12%). Out of 160 cases, babies with SGA were 105 (65.62%), AGA were 55 (34.38%) and LGA were nil in our study which is depicted in Table: 1.

It was found that the Incidence of MSAF was 67 per 1000 live births. Among them (160 cases with MSAF), only 21 (13.12%) developed MAS.

Out of 160 cases with MSAF, 92 (57.5%) babies were male and 68 (42.5%) were female. Out of 160 cases with MSAF, term babies were 156 (97.5%), and post-term were 4 (2.5%).

Babies born to mothers with oligohydramnios with MSAF had 2.81 times more risk of developing MAS than non-oligohydramnios cases which is depicted in Table 2.

Babies born to post-term pregnancy with MSAF had 7.21 times more risk of developing MAS than with term pregnancy which is depicted in Table 3.

Babies born with APGAR<7 with MSAF had 16.62 times more risk of developing MAS than with babies of APGAR>7 which is depicted in Table 4.

Babies of SGA with MSAF had 3.58 times more risk of developing MAS than with non–SGA babies which is depicted in Table 5.

Out of 21 cases with MAS, 9 required ventilation, of which 5 (55.5%) cases needed CPAP support and 4 (19.04%) cases needed invasive mechanical ventilation which is depicted in Table 6. Out of 21 cases with MAS, 16 (76.19%) cases were discharged and 5 (23.80%) babies died which is depicted in Table 7.

Classification of Baby	No. of Cases n (%)
SGA (Small for gestational age)	105 (65.62%)
AGA (Appropriate for gestational age)	55 (34.38%)
LGA (Large for gestational age)	0

Table 1. Distribution of MSAF Cases According to Gestational Age and Birth Weight

Oligo-hydramnios*	Meconium Aspiration Syndrome (MAS)		Total n (%)
	YES n (%)	NO n (%)	
Yes	7 (4.38%)	21 (13.12%)	28 (17.5%)
No	14 (8.75%)	118 (73.75%)	132 (82.5%)
Total	**21 (13.13%)**	**139 (86.87%)**	**160 (100%)**

Table. 2 Distribution of Babies with MSAF and MAS According to Oligohydramnios

Odds ratio- 29.701 (95% CI): 2.81(1.01-7.08)
*Chi-square value= 102.553 df = 1 p=0.000

Post-term Pregnancy*	Meconium Aspiration Syndrome (MAS)		Total n (%)
	YES n (%)	NO n (%)	
Yes	2 (1.25%)*	2 (1.25%)	4 (2.5%)
No	19 (11.88%)	137 (85.62%)	156 (97.5%)
Total	**21 (13.13%)**	**139 (86.87%)**	**160 (100%)**

Table. 3 Distribution of MSAF and MAS According to Post-Term Pregnancy

Odds ratio (95% CI) : 7.21 (1.75-4.64) i.e. Babies born to post-term pregnancy with MSAF had 7.21 times more risk of developing MAS than with term pregnancy.

APGAR <7 *	Meconium aspiration syndrome (MAS)		Total n (%)
	YES n (%)	NO n (%)	
Yes	9 (5.62%)	6 (3.76%)	15 (9.38%)
No	12 (7.5%)	133 (83.12%)	145 (9062%)
Total	**21 (13.12%)**	**139 (86.88%)**	**160 (100%)**

Table 4. Distribution of MSAF Cases with and without MAS According to Apgar <7

Odds ratio (95% CI): 16.62(5.06-54.65) i.e. babies born with APGAR<7 with MSAF had 16.62 times more risk of developing MAS than with babies of APGAR>7.
*Statistically significant p<0.05

Small for Gestational Age (SGA) *	Meconium Aspiration Syndrome (MAS)		Total n (%)
	YES n (%)	NO n (%)	
Yes	18 (11.25)	87 (54.38%)	109 (65.63%)
No	3 (1.87%)	52 (32.5%)	55 (34.37%)
Total	**21 (13.12%)**	**139 (86.88%)**	**160 (100%)**

Table 5. Distribution of MSAF and MAS According to Small for Gestational Age (SGA)

Odds ratio (95% CI) : 3.58(1.01-12.76) i.e. Babies of SGA with MSAF had 3.58 times more risk of developing MAS than with non –SGA babies.
*Statistically significant p<0.05

Type of Ventilation	No. of Cases n (%)
CPAP	5 (55.5%)
Mechanical ventilation	4 (44.5%)
Total	**9 (100%)**

Table 6. Distribution of MAS Cases According to the need for Ventilatory Support

Outcome	No. of Cases n (%)
Discharged	16 (76.19%)
Death	5 (23.80%)

Table 7. Distribution of MAS cases According to Immediate Neonatal Outcome

Out of 21 cases with MAS, 16 (76.19%) cases were discharged and 5 (23.80%) babies died.

DISCUSSION

Meconium aspiration syndrome (MAS) is a common neonatal problem associated with Meconium-stained amniotic fluid (MSAF). Aspiration can occur with foetal gasping or after birth with first breaths of life. Meconium aspiration can lead to increased perinatal morbidity and mortality and the majority of infants born with MSAF show no long-term impairments.

In our study, the incidence of MSAF is 6.7% which is comparable to other studies made by Patil et al,[11] (8.3%), Fischer et al[12](7.93%). The incidence of MSAF greatly varies in different reports from 7-22%.

In the present study, the incidence of post-term babies with MSAF is 4 (2.5%) which is low compared to other studies like Naveen et al which is a community based prospective study.

The incidence of meconium aspiration syndrome (MAS) in babies born to mothers with Meconium-stained amniotic fluid (MSAF) in our study was 21 (13.12 %) which is comparable with other studies like Cleary GM et al (13) 1896 (15.59%) and Patil et al[11] 32 (12.9%).

In our study, the number of babies with MAS in post-term pregnancy (50%) is high compared to other studies like Mohammad Reza Sedaghatian et al[14] 2 (6.6%) which is a community based study. This may be because of less number of post-term deliveries in our study.

In our study, the number of babies with MAS with APGAR <7 is 60% which is comparable with other Indian studies like Patil et al(11) (66.6%).

Regarding Neonatal Mortality outcome of Babies with MAS & MSAF in our Study

Out of 21 cases with MAS, 16 (76.19%) cases were discharged and 5 (23.80%) babies died. From the literature,[15,16] the mortality of babies with MAS ranged from 0 to 30%. The higher mortality in our study may be attributed to the high number of high risk pregnant mothers referred to our tertiary care centre.

CONCLUSION

Meconium-stained amniotic fluid (MSAF) affects mostly full term and post-term babies. MSAF alone is not associated with an adverse neonatal outcome, majority of the babies remain asymptomatic in spite of MSAF and require only routine care. Increased incidence of MAS was found in babies who had Post-term pregnancy, SGA babies, oligohydramnios, Apgar score <7 and associated medical illness in the mother. These babies required ventilator support, hence they require continuous and close monitoring. Hence, the management is a combined approach of an Obstetrician and a Paediatrician, right from proper monitoring of maternal risk factors to meticulous newborn resuscitation and post-resuscitation care in a tertiary level neonatal intensive care unit.

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