RISK FACTORS FOR MECONIUM ASPIRATION AND MAS (MECONIUM ASPIRATION SYNDROME) IN NEONATES BORN THROUGH MECONIUM STAINED AMNIOTIC FLUID (MSAF) IN A TERTIARY CARE CENTRE IN MALABAR (KERALA)

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ABSTRACT: Objectives: The aim of this study is to determine the incidence and risk factors for MSAF and MAS and to find out whether there any respiratory and neuro-developmental morbidity and mortality among babies with MAS. **MATERIAL AND METHODS:** This is a longitudinal study carried out at Institute of Maternal and Child Health, Government Medical College Kozhikode, Kerala. 301 pregnant women with neonates born through MSAF between 1st December 2008 to 30th November 2009 were studied. Their case records were analyzed in two steps: I - Demographic profile of antenatal, intrapartum risk factors and neonatal outcome of pregnancies complicated by MSAF . II- Babies were divided between MAS (n=65) and non MAS (n=236) groups. Maternal and neonatal risk factors compared between them. Data statistically analyzed by chi-square test using statistical software Epi info 3.5. **RESULTS:** Antenatal risk factors like IUGR, hypertensive disorders and oligoamnios is significantly associated with development of MAS. Delayed milestones and recurrent respiratory tract infections were the morbidities. **CONCLUSION:** The incidence of meconium staining of liquor was found to be 3.2% of all live births, with meconium aspiration syndrome (MAS) occurring in 21.5% of these neonates. Complications were more (72.3%) among MAS babies when compared to non MAS babies (6.8%). Mortality was seen only in MAS babies i.e. 13.8%. On follow up 49.2% babies were normal, 4.6% had cerebral palsy and 10.7% had recurrent respiratory tract infection.

KEY WORDS: MSAF (Meconium stained amniotic fluid), MAS (Meconium Aspiration Syndrome), IUGR (Intra uterine growth restriction), oligoamnios

INTRODUCTION: Meconium stained amniotic fluid is always a cause for alarm to any obstetrician. Neonates born through MSAF are at risk of respiratory and neurodevelopment morbidity and mortality, and longer hospitalization. Hence a knowledge of the risk factors for development of MAS can help to minimize its severity .Various studies have reported the incidence of MSAF to range from 5.6% to 24.6% (median 14%)^{1,9}. MAS occurs in 1.7 to 35.8% (median 10.5%) of these babies^{1,9}

This perinatal complication is mostly seen in term and post term babies. Term babies born through MSAF are more likely to suffer from respiratory morbidity when compared to babies born through clear amniotic fluid. 38% of these babies develop seizures or die.

MAS is a life threatening condition. But, not all babies born through MSAF develop MAS. Knowledge of the risk factors for the development of MAS can be helpful in the selection of mothers whose babies are at high risk and may benefit from close observation intrapartum. Neonates at high risk for developing MAS can also be given added neonatal care.

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AIMS AND OBJECTIVES: The aim of this study is to determine the incidence and risk factors for MSAF and MAS and to find out whether there any respiratory and neuro-developmental morbidity and mortality among babies with MAS.

MATERIAL AND METHODS:

Study Design: It is a longitudinal study carried out at Institute of Maternal and Child Health, Government Medical College Kozhikode, Kerala.

Sample Size: 301 pregnant women with neonates born through MSAF between 1st December 2008 to 30th November 2009.

Inclusion criteria: All term and post term pregnancies with singleton fetus in vertex presentation and MSAF detected in labour or during delivery (vaginal or cesarean section)

Exclusion criteria: Preterm gestation, Breech presentation, Multiple pregnancy, Congenital malformation and Intrauterine fetal demise.

METHODOLOGY: A thorough antenatal and medical history is taken for all patients satisfying the inclusion criteria and variables like maternal age, ANC risk factors, labour details, grade of meconium, neonatal outcome and development of MAS were noted. Babies were followed up at 1 and 6 months of age to assess respiratory and neuro developmental morbidity if any . Risk factors were statistically analyzed by chi-square test. P value < 0.05 was taken as significant.

RESULTS: There were 9200 live births during the study period. Out of these 301 (3.2%) of neonates were born through MSAF. Data analyzed in two steps:

Part I: demographic profile of the antenatal, intrapartum risk factors and neonatal outcome of pregnancies complicated by MSAF in labour (Table 1)

Complications: Nil 74.1%, Sepsis 9.7%, HIE 3.4%, Chest X-Ray opacity 3.4%, Rh incompatibility 2.5%, Hyperbilirubinemia 1.9%, PPHN 1.6%, Severe PNA 1.2%, Air leak 0.9% and Hypoglycemia 1.2%

Part II: Babies were divided between MAS (n=65) and non MAS (n=236) groups. Maternal and neonatal risk factors were then compared between the two groups and the significant risk factors for MAS derived.

The incidence of MSAF in this study is found to be 3.2% of all live births. The incidence of MAS is 21.5%.

Demography: Mean maternal age: MAS- 23.24 + 2.3 and NONMAS-24.3 + 3.1 (p=0.558)

Primi parity: MAS 22.8% and NONMAS-77.2% (p=0.425)

Referred MAS 22.9% and NONMAS- 77.08% (p=0.800)

Gestational age >40 weeks MAS 14% and NONMAS -86% (p=0.153)

Table 2 shows Antenatal risk factors between MAS and Non MAS groups

Ultrasonography: MAS was significantly more when ANC USG showed abnormal doppler or oligoamnios

(i) Abnormal Doppler MAS 39.1% and NONMAS 60.0% (p=0.03)

(ii) Oligoamnios MAS 40% and NONMAS 60% (p=0.03)

Non stress test: MAS was not associated with non reactive Admission Test
MAS 25% and NONMAS 75% ($p=0.901$)

Labour induction: MAS was significantly more in PGE2 inductions

- (i) Induced labour MAS 29.5% and NONMAS 70.5% ($p=0.028$) RR (1.05-2.5)
- (ii) PGE1 MAS 16.1% and NONMAS 83.9%
- (iii) PGE2 MAS 37.5% and NONMAS 62.5% ($p=0.032$) Chi-square RR (0.98-10.5)

Meconium Detection: Hind water MSAF was significantly associated with MAS

- (i) Hind water meconium MAS 32.4% and NONMAS 67.6% ($p=0.0003$) RR 2.19 (1.42-3.36)
- (ii) Meconium before delivery MAS 15.1% and NONMAS 84.9%

Intrapartum factors (Table 3) MAS significantly associated with FHR abnormalities, intrapartum oxytocin, Grade III meconium and non amnioinfusion group and rupture of membrane to detection of MSAF interval >12 hours.

Mode of delivery: Of all the babies born by vaginal delivery, 76 (66.6%) were NONMAS babies whereas only 38 (33.3%) babies developed MAS. When normal vaginal delivery was compared with other modes of delivery, MAS was more in normal vaginal delivery. $p = 0.006$, RR – 1.86 (1.22-2.85). When vaginal delivery (both normal and instrumental vaginal delivery) was compared with LSCS, MAS was significantly more in vaginal delivery; $p = 0.000$, RR – 2.31 (1.49-3.57).

Neonatal variables (Table 4) MAS was strongly associated with Apgar <5'7 and in depressed babies. NICU admission was 95.3% among MAS babies, whereas it was only 8.1% among non MAS babies. There were total 9 neonatal deaths, all were MAS babies This study identified the following neonatal risk factors to have significant association with MAS a) Apgar score <7 at 5 minutes b) Depressed babies c) Presence of meconium below the cords .

MAS and neonatal outcome Most of the babies with MAS in the study recovered well with conservative management including antibiotic treatment. But there were 9 neonatal deaths among MAS babies

Neonatal complications: More among MAS babies. 72.3% Vs 6.8% in NONMAS babies, most common being sepsis, HIE, chest X-ray opacity, severe perinatal asphyxia, PPHN and air leak in order of occurrence.

Follow up of MAS babies at 1 and 6 months:

Out of the 236 cases of MSAF, there were no neonatal deaths, but 60 babies lost follow up. Of the remaining 176 cases, only 10 babies (5.68%) had recurrent respiratory infections. Their growth and development milestones were normal for their age.

Out of the 65 babies with MAS, 9 succumbed to death in the neonatal period. 14 babies lost follow up. Of the remaining 42 babies, 3 babies (4.6%) developed cerebral palsy with delayed milestones. 32 babies (49.2%) followed up to six months of age had no respiratory or neurodevelopment morbidities. 7 babies (10.7%) had complaints of recurrent respiratory infections.

DISCUSSION: MAS was not associated with age, parity, status of ANC and gestational age. Bhaskar et al¹ showed the MAS group to have significantly more number of primipara, post term gestation and unbooked mothers. There is significant association between MAS and IUGR, oligoamnios, and hypertensive disorder. Bhaskar SH¹ found that MAS was significantly higher in toxemia of pregnancy. Usta et al² found no significant association of MAS with preeclampsia and diabetes.

A study by BB Matonhodze et al³ Gupta et al⁴ observed MSAF in 12% of patients given dinoprostone compared to 8% of patients given misoprostol. A study by Deborah et al⁵ showed a higher prevalence of meconium passage in misoprostol group (27.9%) than in dinoprostone group (10.5%) which was significant. A study by Tayyiba Wasim et al⁶ showed that meconium staining and fetal heart abnormalities were more in misoprostol group. Giving amniotomies was found protective against MAS. Cochrane review by Hofmeyer GJ⁷ on Amniotomies for MSAF in labour showed that under standard perinatal surveillance, amniotomies were associated with reduction in MAS, neonatal hypoxic ischemic encephalopathy. The NICU admissions were reduced; there was a trend towards reduced perinatal mortality. Rathor AM et al⁸ observed that amniotomies were associated with reduced caesarean rates, decreased incidence of meconium at the vocal cords, improvement in apgar scores and fewer cases of respiratory distress.

Bhaskar SH et al¹ observed that incidence of MAS was high in LSCS deliveries.

Low apgar score as a risk factor for MAS is also supported in studies done by Usta et al² and Liu WF et al⁹. Presence of meconium below the vocal cords was proved to be a risk factor in studies by Meydanli et al¹⁰.

All deaths and long-term morbidity occurred in babies with abnormal cardiotocographs or in unmonitored infants¹¹.

CONCLUSION: The incidence of meconium staining of liquor was found to be 3.2% of all live births, with meconium aspiration syndrome (MAS) occurring in 21.5% of these neonates. MAS was significantly associated with antenatal risk factors like IUGR, hypertensive disorders in mother, oligoamnios and abnormal Doppler. The intrapartum variables significantly associated with MAS are Induced labour, oxytocin administration, no amniotomies (as in hind water meconium), Intrapartum fetal heart rate abnormalities, duration between rupture of membranes to the detection of meconium in liquor >12 hours and Grade 3 meconium. MAS was significantly higher in vaginal delivery when compared with caesarean deliveries. The neonatal variables found to be significant risk factors for MAS are depressed baby, Apgar at 5 minutes <7 and presence of meconium below the vocal cords.

Complications were more (72.3%) among MAS babies when compared to non MAS babies (6.8%). Mortality was seen only in MAS babies i.e. 13.8%. On follow up 49.2% babies were normal, 4.6% had cerebral palsy and 10.7% had recurrent respiratory tract infection.

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Age	21-25 years : 57.8%	>25 years: 42.2%		
Parity	Primi: 71.4%	Para ≥2: 28.6%		
Gestational age	37-40 weeks: 83.4%	>40 weeks: 16.6%		
ANC status	Booked: 83.1%	Unbooked: 16.9%		
ANC risk factors	No risk: 86%	Risk : 24%		
ANC-USG	Normal: 86%	Abnormal : 24%		
Admission test	Reactive : 98%	Non reactive : 2%		
Onset of labor		Spontaneous: 54.8%	Induced: 37.7%	Not in labour: 7.9%
Mode of induction		PGE2: 64.3%,	PGE1: 27.6%,	Foley EAS: 8.1%.
Meconium detected:	Before delivery:63.8%	Hind water: 36.2%		
Grade of meconium	Grade I: 24.6%,	Grade II: 47.8%	Grade III: 27.6%	
MSAF delivery interval:	<1hour : 14.6%,	1-hours:33.22%,	4-6 hours:12.6%,	hind water :36.21%
Mode of delivery	Normal: 34.2%,	Vacuum: 3.7%,	CS (other): 57.8%	CS (fetal distress) :4.3%

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Baby details:				
a) BW	<2.5kg : 14.6%,	2.5-4kg : 83.4%	>4 kg : 2%	
b) Sex	Male: 51.5%	Female: 48.5%		
c) Activity	Vigorous :80.4%	Depressed: 19.6%	5'<7 : 6%	
d) Apgar score	1'9: 81.4%	1'<7 : 12.6%	ET Suction:	
e) Mode of resuscitation	Routine :79.1%	Oxygen : 18.2%	20.5%	IPPV: 10.9%
TABLE I : ANC, INTRAPARTUM AND NEONATAL VARIABLES				

Risk factor	MAS		Non MAS		p value	RR
	No.	%	No.	%		
IUGR	8	50	8	50	0.005	2.5 (1.45-4.3)
Oligoamnios (clinical and ultrasound diagnosed)	8	40	12	60	0.03	1.97 (1.15-3.54)
Hypertensive disorders	14	36.8	24	63.1	0.02	1.83 (1.13-2.96)
Maternal diabetes	4	25	12	75	0.734	
Anemia	14	20.3	55	79.7	>0.05	
Ante partum hemorrhage	1	50	1	50	>0.05	
Heart disease	1	14.3	6	85.7	>0.05	
Thyroid disorders	1	33.3	2	66.7	>0.05	
Decreased fetal movements	1	20	4	80	>0.05	
TABLE II: RISK FACTORS						

	MAS		Non MAS		p value	RR
	No.	%	No.	%		
FHR abnormalities	13	54.2	11	45.8	0.0002	2.89
Oxytocin	20	35.7	36	64.3	0.008	1.94
No amnio infusion (hindwater MSAF)	37	33.3	74	66.7	0.0004	2.26
Abnormal progress of labour	11	20.8	42	79.2	0.87	
ROM to MSAF interval >12 hrs	16	44.4	20	55.6	0.03	1.78 (1.07-2.96)
Grade 3 meconium	31	37.3	52	62.7	0.0001	2.39 (1.58-3.63)
Table III: INTRAPARTUM FACTORS						

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	MAS		Non MAS		p value	RR
	No.	%	No.	%		
Birth weight						
<2.5kg	12	27.3	32	72.7	0.595	
>2.5kg	53	20.6	204	79.4		
Sex						
Male	31	20	124	80	0.488	
Female	34	23.3	112	76.7		
Apgar <5'7	18	100			0.0000	15.25 (9.28-25.04)
Vigorous	8	3.35	231	96.6	0.0000	27.47 (13.84-54.5)
Depressed	57	91.93	5	8.06		
Meconium below the vocal cords	49	100			0.000	24.53 (10.11-30.20)

Table IV: NEONATAL VARIABLES

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