Meconium Stained Amniotic Fluid – A Potential Predictor Of Meconium Aspiration Syndrome.

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Abstract:

Objective: To identify potential predictors of Meconium Aspiration Syndrome (MAS) in pregnancies complicated by meconium-stained amniotic fluid (MSAF) & to review the incidence, morbidity and mortality of Meconium Aspiration Syndrome (MAS). **Methods:** In the period of 2003 to 2006,175 pregnancies with thick meconium-stained AF were delivered; of these, 15 neonates developed MAS and 160 did not. The two groups were compared retrospectively according to maternal findings, pregnancy outcome, and neonatal complications, using univariate analysis ($P < 0.05$ considered significant) and stepwise multiple logistic regression analysis to identify independent significant factors for prediction of MAS. **Results:** Incidence of MSAF was 13.97% and that of MAS was 8.57%. All deliveries associated with thick MSAF had developed MAS. 40% mothers were associated with PROM & prolonged labour. Most common & significant risk factors associated with MAS were increased gestational age, increased cesarean section (LSCS) & low Apgar scores at 1 minute and 5 minute. Mortality rate was 6.66% & mechanical ventilation was used in only 1(6.66%) case. **Conclusion:** MAS are associated with higher incidence of LSCS, lower 1 minute & 5 minute Apgar score & higher gestational weeks. 40% mothers were associated with PROM & prolonged labour. The neonatal morbidity & mortality is significantly more frequent in relation to thick meconium stained amniotic fluid. Specific delivery room resuscitation procedure, early diagnosis & proper management can prevent development of MAS as well as morbidity & mortality.

Key words: Meconium Stained Amniotic Fluid, Meconium Aspiration Syndrome and Apgar Score.

Introduction

Meconium Staining of Amniotic Fluid (MSAF) is a relatively common problem occurring in 8-15% of all deliveries [1]. The most important concern with MSAF is its association with foetal distress and adverse perinatal outcome. The first intestinal discharge from newborns is Meconium, which is a viscous, dark green substance composed of intestinal epithelial cells, lanugo, mucus, and intestinal secretions, such as bile. Intestinal secretions, mucosal cells, and solid elements of swallowed amniotic fluid are the 3 major solid constituents of Meconium. Water is the major liquid constituent, making up 85-95% of Meconium. Intrauterine distress can cause passage into the amniotic fluid. Factors that promote the passage in-utero include placental insufficiency, maternal hypertension, pre-ecclampsia, oligohydramnios, and maternal drug abuse, especially of tobacco and cocaine [2]. Meconium Stained Amniotic Fluid may be aspirated during labour and delivery, causing neonatal respiratory distress. Because Meconium is rarely found in the amniotic fluid prior to 34 weeks' gestation, Meconium Aspiration chiefly affects infants at term and post-term. *Ostera* found that 78% of MSAF occurred between 38 and 42 weeks of gestation [3]. MAS develop in 5-10 % of the babies born through MSAF [4]. Meconium Aspiration Syndrome (MAS) is a disease with complex pathophysiology & a potential for mortality and considerable morbidity. Despite the recent advances in neonatal care, at least 5% of MAS babies admitted to neonatal intensive care unit (NICU) have been reported to die. Five percent of MAS babies require oxygen in the neonatal period. Infants developed complications including persistent foetal circulation, pneumothorax, and acute renal failure. No reliable data is available as to the incidence of MAS in developing countries including Nepal where sizable numbers of deliveries are conducted at home. There is no uniform standard protocol for management of such babies. So this work has been undertaken to evaluate the management of MSAF babies in the delivery room and its further outcome.

Aim Of Study:

To review the incidence, morbidity and mortality of Meconium Aspiration Syndrome (MAS) and also to identify possible predictors of MAS in newborns with Meconium Stained Amniotic Fluid (MSAF).

Materials and Methods:

The descriptive, quantitative and retrospective analysis of babies born through MSAF at Manipal College of Medical Sciences (MCOMS), Pokhara, Nepal from January 2002 to December 2005 was done in relation to predict different risk factors that increased the morbidity & mortality of MAS. Babies having culture positive septicaemia and any other congenital or cardiac disease were excluded from study. P-value less than 0.05 were considered significant.

Results:

Out of total 1252 babies in the study 372 (29.72%) were delivered by caesarean section (LSCS) and those by Normal Vaginal Delivery (NVD) were 880 (70.28%). 175 (13.97%) babies had been born through MSAF. As per T*able-*

I out of 175 cases of MSAF deliveries 160 showed thin meconium and 15 had thick / pea soup meconium. These 15 (100%) babies developed MAS. *Table-II* shows that break down of 175 cases born through MSAF correlated with the type delivery and development of MAS. There were 113 NVD cases with MSAF out of which 5 (4.42%) developed MAS. Incidence of LSCS in MAS (66.7%) was significantly higher than that of MSAF (32.5%) ($p<0.05$). In the present study (Table-III) those that developed MAS had significantly low 1 minute and 5 minute Apgar score than those who did not develop MAS ($p < 0.005$). MAS babies are associated with higher gestational age (>41.20+1.80weeks) as compared with MSAF (39.50+2.80weeks)**.** Differences in relation to maternal age, birth weight and parity of mother between 2 groups were not statistically significant. Babies with MAS (n=15) showed varying degree of pulmonary parenchymal pathology such as diffuse patchy infiltration, lobar consolidation, atelectasis, airleak syndrome etc, with no direct relation between severity of MAS and degree of radiological lesions. *Table-IV* focuses upon the resuscitative measure done for 175 MSAF babies. All 15 babies born through thick MSAF had tracheal suction done. Other group had only oropharyngeal suction and gastric aspiration performed. As per *Table-V* three (3) mothers had PROM and nine (9) had prolonged labour with foetal distress. Mothers with PROM were given antibiotic coverage prior to delivery. *Table-VI* depicts specific morbidity pattern of 15 MAS babies. Respiratory infiltration in X-ray chest positively was present in all babies with MAS (100%). Other morbidity factors were hyperbilirubinimia (70%), seizure, HIE and overwhelming sepsis. *Table- VII* shows the out come of MAS group. All 15 babies were given antibiotic routinely for 3 days except in one baby who was given antibiotics for 5 days because the c-reactive protein (CRP) was positive. Photo therapy were used for 10 babies out of 15 MAS cases for treatment of hyperbilirubinemia. One infant was managed with mechanical ventilation (6.66%). Mortality was 6.6%, which was comparable to the study, conducted by Bhatia, et.al [6].

Table-I: Showing Delivery Room Observations of 1252 Babies.

Categories	Total(n)	NVD-n	LSCS-n	Total %age
No of deliveries	1252	880	372	—
MSAF	175	113	62	13.97
Thick MSAF	15	5	10	8.57
Thin MSAF	160	108	52	91.5
MAS	**15**	**5**	**10**	**8.57**

Table-II: Mode Of Delivery In 175 Cases Of MSAF With MAS.

Category	Mode of delivery	Number	% Age
MSAF	NVD	108	67.5
MSAF	**LSCS**	52	**32.5**
MAS	NVD	5	33.3
MAS	**LSCS**	10	**66.7**

Table III: Characteristics Of The Meconium Aspiration Syndrome (MAS) and The Meconium Stained Amniotic Fluid (MSAF) Groups.

CATEGORY	MSAF with MAS GROUP (n-15) Mean SD	MSAF without MAS (n-160) Mean SD	P-VALUE
Birth weight	3.25+2.65	3.24+3.64	>0.05
Gestational age	41.20+1.80	39.50+2.80	***<0.05***
Apgar score 1 min	6.00+1.98	7.20+2.60	***<0.05***
Apgar score 5 min	7.65+2.06	8.90+2.90	***<0.05***
Maternal age	27.00+6.20	25.00+5.25	>0.05
Parity	2.50+1.36	2.00+1.76	>0.05

Table-IV: Resuscitation Procedures at Delivery Of 175 Cases

Category	Thick MSAF	Thin MSAF
Oropharyngeal suction	15	160
Gastric aspiration	15	160
Tracheal suction	15	00

Table- V: Maternal Status at the Time of Delivery in 15 Cases of MAS.

EVENTS	NUMBER	% AGE
PROM	3	20
Prolonged labour	3	20
Fetal distress in mother	9	60

Table-VI: Morbidity Pattern of MAS Babies (n=15).

EVENTS	NUMBERS	% AGE
Sepsis	1	6.66
Seizure	1	6.66
Respiratory distress with		
Positive chest x-rays	15	100
Hyperbilirubinemia	10	66.66
Hypothermia	2	13.33
HIE	1	6.66
Acute renal failure	0	0.0

Table-VII: Outcome of MAS Babies (n=15).

EVENTS	NUMBER	% AGE
3 days antibiotics	14	93.4
Phototherapy	10	66.66
Mechanical ventilation	1	6.66
Overall mortality	1	6.66

Discussion:

With a view to evaluate the morbidity, mortality and possible predictors of MAS in MSAF babies, the study concluded some important facts which need to be observed in managing these cases in developing countries with limited resources.

Meconium-stained amniotic fluid (MSAF) is present in 8-15 % of all deliveries. Our data like other studies shows higher rate of MSAF in higher gestational age. It is interesting to note that all term babies don't pass Meconium in amniotic fluid. The reasons being: i) Presence of thick viscous Meconium cap at the distal end of a GIT. ii) Pronounced peristaltic movements are unusual in foetus and iii) Anal sphincter tone is greater in foetus than neonate.

MSAF is unusual before 36 weeks of gestation (5%). This is postulated to be due to the increasing levels of intestinal hormone motilin with increasing gestational age which brings about faster intestinal movements, defecation and maturation of innervations of GIT associated with vagal stimulation [7]. Levels of this hormone could be taken as a useful predictor of pre and or intrapartum asphyxia in the sense that more motilin could effect more Meconium passage into amniotic fluid giving rise to thick or pea-soup appearing MSAF and resultant out come. MSAF in itself is a sign of foetal hypoxia and acidosis. *Burgess AM, Hutchins GMin* 1996 reviewed 123 autopsies with history suggestive of MAS and found high incidence of pulmonary infiltration, umbilical cord constriction, and inflammation of both umbilical cord and chorionic plate[8]. They speculated that Meconium itself may be potential cause of foetal distress.

MAS is defined as a condition where after the aspiration the neonate develops respiratory distress, staining of nails, cord skin and other symptoms that cannot be explained [8]. Our centre has employed a selective approach to the airway management of infants with Meconium-stained fluid. Infants with clear amniotic fluid were managed without tracheal suctioning. The obstetrician routinely suctioned the oral and nasopharyngeal airway of any foetus exposed to Meconium-stained fluid before delivery of the shoulder and thorax. After delivery, infants with thin Meconium stained fluid were managed similar to infants with clear amniotic fluid. Post-delivery neonatal management of infants born through thick Meconium stained fluid were based on the infant's condition immediately after birth. Infants with good tone, respiratory effort, and cry did not receive routine laryngoscopy or tracheal suctioning. Depressed infants had laryngoscopy performed [9]. Suction was applied through either an endotracheal tube or a 10-F suction catheter with wall suction of at least 100 mmHg. Use of assisted ventilation via endotracheal tube was applied as needed following the guidelines of the American Academy of Pediatrics and American Heart Association or Neonatal Resuscitation Program (NRP) [10]. Aspiration of Meconium causes considerable perinatal morbidity and mortality. We observed in our study that 13.97% of total live births were associated with MSAF and 8.5% of MSAF babies developed MAS. These findings are consistent with other studies [1,3].

Newborns with thick MSAF were more likely to develop MAS if they had fetal distress and Meconium was not sucked from the trachea at birth. Passage of thick Meconium was significantly associated with severe asphyxia and carried a bad prognosis with increased risk of development of Meconium aspiration syndrome, hypoxic ischaemic encephalopathy, seizures and pulmonary air leak syndrome. Our study shows that all the babies with thick MSAF had MAS and all these babies had direct tracheal suction in the delivery room. 80% of our intubated newborns showed tracheal Meconium and all of them developed MAS. Liu WF, Harrington T, made similar observations [11].

Another observation from our study is that the group that developed MAS had a significantly ($p< 0.005$) higher incidence of Lower Section Cesarean Section (LSCS) than the group that did not develop MAS, which is 66.6% and 32.50%, respectively. These results are again consistent with the findings from other studies [12]. Some studies have shown that babies with MSAF have lower 1-min and 5-min Apgar scores than the babies that do not have MSAF [13]. In our study, neonates who developed MAS and had a 1-min and 5-min Apgar scores of 6 or less had significantly lower scores ($p<0.005$) than those who had no MAS with MSAF. MAS babies are associated with higher gestational age (>40.27+1.81weeks) as compared with MSAF (39.50+2.89weeks) which was consistent with study done by *Bhasker S.H* [5]. There is a very interesting finding in relation to indication of LSCS and neonatal outcome. Nine cases out of ten LSCS babies having foetal distress with or without non-progression of labour had indication of for LSCS. This is in tune with the study done by *Bhaskar SH, Karthikeyan G, Bhat BV, and Bhatia BD* [5]. Antibiotic treatment did not affect the clinical course and outcome related to infection in MAS without perinatal risk factors for infection and without ventilator use. Similar observation was made by *Lin HC, Su BH, Tsai CH, Lin TW, Yeh TF* [12]. There was only one death

(6.66%) and one baby needed mechanical ventilator in the MAS. *Bhatia BD, Gupta V, and Dey PK* made similar observation[7].

Conclusion:

The neonatal morbidity was significantly more frequent in relation to thick Meconium and also when perinatal asphyxia was associated with MSAF. Thick Meconium is implicated as a risk factor influencing the well being during the intrapartum and postpartum periods. These can be inferred from the study with review of literatures showing that: a) MAS are associated with higher incidence of LSCS. b) MAS had lower 1 minute and 5 minute Apgar score. c) MAS are associated with higher gestational weeks. d) 40% mothers were associated with PROM and prolonged labour. Identification of post-term pregnancy and prenatal asphyxia are the best preventions for MAS. Early identification of antenatal and perinatal risk factors, higher cesarean delivery rates, and decrease in the proportion of post-dated births, appropriate delivery room management and diagnosis of post natal complication with its timely management can prevent morbidity and mortality of MAS.

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