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Obstetric and perinatal outcome of pregnancies with term labour and meconium-stained amniotic fluid

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Abstract The purpose of this study was to evaluate the meconium staining of amniotic fluid (AF) in term of fetal distress, meconium aspiration syndrome, and perinatal morbidity and mortality. In a prospective study at Princess Badeea Teaching Hospital from April to November 1999, women with a singleton cephalic pregnancy of completed 37–42 weeks and with no pre-defined risk factor were recruited into the study. Study patients comprised 390 (10%) patients with meconium and 400 patients as controls but with clear amniotic fluid. Virtually meconium staining of the amniotic fluid was significantly associated with poor neonatal outcome in all outcomes measures assessed. Perinatal mortality increased from 2 per 1000 births with clear AF to 10 per 1000 with meconium ($P<0.001$). Other adverse outcomes also increased; e. g. , severe fetal acidemia, Apgar score ≤3 at 1 min and 5 min, and meconium aspiration syndrome. Delivery by cesarean section also increased with meconium from 7–14% ($P<0.001$). We concluded that meconium in the amniotic fluids associated with an obstetric hazard and significantly increase risks of adverse neonatal outcomes. Women with thin meconium in the presence of normal fetal heart rate can be safely managed at the clinical level. Mod-thick meconium alone should alert the obstetrician to a high risk fetal condition. Continuos fetal heart rate monitoring during labour and reassurance of fetal well-being by acid-base assessment were most significant factors in the reduction of meconium aspiration syndrome.

Key words Meconium stained amniotic fluid · Clear amniotic fluid · Perinatal outcome

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Introduction

Approximately 10–20% of live births demonstrate meconium in the amniotic fluid, (AF) yet few infants are adversely affected, therefore the current risks associated with meconium remain uncertain and controversial [16, 20]. Some investigators believe that meconium-stained amniotic fluid (MSAF) is not associated with fetal hypoxia, acidosis, or fetal distress and may be a normal physiologic event [13, 15]. Recent reports have found an increased risk of fetal distress, neonatal respiratory distress, and increased perinatal morbidity and mortality [5]. MSAF also increases the incidence of meconium aspiration syndrome (MAS) and fetal acidemia at birth [3, 8, 17].

The cesarean section rate is higher in deliveries complicated by MSAF [11]. The rate of clinical intra-amniotic infection was significantly higher in women with meconium MSAF [1, 19].

The objective of our study was to evaluate the role of meconium-staining of AF in term of fetal distress, MAS, and the perinatal morbidity and mortality.

We also looked at the appropriate management of the mother, the delivery room management of the meconium-stained infant, and the treatment of neonates clinically ill with MAS.

Materials and methods

A total of 3850 deliveries at Princess Badeea Teaching Hospital were studied over eight months between April and November, 1999. 390 (10.13%) of the deliveries had meconium in the amniotic fluid compared prospectively with 400 similar pregnancies with clear AF as a control group with similar pregnancies.

The criteria of inclusion for the study and control groups were term (38–42 weeks) singleton gestation, cephalic presentation, live fetus on admission, umbilical blood gas analysis, and birth weight ≥2500 g. We excluded women with previous cesarean sections, pregnancies complicated by pregnancy induced hypertension, diabetes mellitus, and infants with congenital anomalies.

Recorded data included maternal age, estimated gestational age, presence of abnormal fetal heart rate patterns, mode of deliv-

Table 1 Pregnancy characteristics with or without Meconium-stained amniotic fluid (MSAF)

Characteristics	Control (*n*=400)	Thin (*n*=175)	Mod-Thick (*n*=215)	*P*
Maternal age [year]	28.6±4.2	28.20±4.8	28.8±5.6	NS
Parity	1.2±0.8	2.25±2.1	2.35±2.5	NS
Gestational age [week]	40.2±1.5	40.0±1.2	40.5±1.4	NS
Birth weight [g]	3356±450	3456±500	3512±500*	<0.05
Chorioamnionitis	12 (3%)	10 (6%)	30 (14%)*	0.01
Spontaneous delivery	344 (86%)	150 (85.7%)	174 (80.9)	NS
Cesarean delivery (Total)	28 (7%)	17 (10%)	30 (14%)*	<0.001
Forceps-vacuum	20 (5%)	8 (4.5%)	11 (5%)	NS

Ns not significant
**P* for variable mod-thick meconium vs clear fluid

Table 2 Labour and delivery outcome in relation to control (clear AF) or meconium-stained amniotic fluid (MSAF)

Labour and delivery outcome	Control *n*=400		Thin *n*=175		Mod-Thick *n*=215		*P*
	n	%	*n*	%	*n*	%	
Fetal heart rate abnormality	52	13	33	19	64	30[a]	0.01
Labour stimulation	80	20	26	14	17	8[a]	<0.001
Fetal acidosis arterial cord pH less than 7.20	36	9	21	12	45	21[b]	0.01
Oxygen support	16	4	12	7	45	21[a]	0.01
Apgar score							
1 min<7	24	6	21	12	64	30[a,c]	0.01
5 min<7	4	1	3	2	13	6[c]	0.01
Cesarean delivery	28	7	17	10	30	14[a]	<0.001
Dystocia	20	5	14	8	16	7.4[a]	<0.001
Fetal distress	12	3	14	8	17	8[a]	<0.001
SCBU admission	12	3	7	4	28	13[d]	<0.01
Meconium aspiration syndrome	0	0	1	0.57	7	3.25[a]	<0.001

[a] *P* variable mod-thick meconium vs clear fluid and thin meconium (significant)
[b] *P*<0. 01 vs control and thin meconium (significant)
[c] *P* for mod-thick vs control and thin meconium (significant)
[d] *P*<0.01 vs all others

ery, birth weight, presence and consistency of meconium, presence of meconium in trachea, presumed chorioamnionitis, umbilical cord blood gases, Special Care Baby Unit (SCBU) admission, oxygen therapy, and mechanical ventilation (Table 1,2).

Resident pediatrician trained in oral, nasal, and pharyngeal suction attended all births with meconium.

Infants born through thin meconium stained AF are routinely suctioned by the obstetrician or midwife before delivery of the thorax and suctioned routinely by pediatrician after delivery.

All infants born through moderate or the meconium stained AF reserve thorough suctioning of the nose and oropharynx by the delivery obstetrician or well trained midwife. After delivery, the infants is handed to the pediatrician, and immediately evaluated.

The decision to suction was determined in the delivery room by the pediatric care provider.

Statistical analysis compared the control infants, infants with thin meconium and infants with mod-thick meconium staining.

Infants with moderate to thick meconium were further analyzed based on whether tracheal suction was preformed in the delivery room.

Statistical analysis was by χ^2 test and student t test. Differences were considered statistically significant when $P<0.05$.

Results

We studied 3850 live born, singleton term infants, 390 (10.13%) were accompanied by meconium-stained amniotic fluid (MSAF); thin meconium staining was present in 215 infants. In 103 infants with moderate to thick meconium stained AF suctioning of the airway was preformed and in 112 was not attempted.

Table 1 shows that there was a statistical significance increase in the birth weight ($P<0.05$), chorioamnionitis ($P=0.01$), and cesarean deliveries ($P<0.001$) between those pregnancies with moderate to thick meconium compared to mothers with clear AF.

Table 2 shows labour and delivery outcome and grade of meconium. Moderate or thick meconium had a significantly greater risk of abnormal FHR tracing in each stage of labour, a 1- or 5-min Apgar score less than 7, a cord arterial pH less than 7.20 (fetal acidemia), the need for oxygen support, SCBU admission, and meconium aspiration syndrome.

Labour stimulation by oxytocin was used more in clear AF than MSAF.

Examination of neonatal outcome in relation to clear AF or MSAF is whoen in Table 3. The data were then stratified into 2 groups:

– 400 patients without meconium (clear fluid), and
– 390 were considered the meconium fluid group.

Apgar scores of ≤3 at 1 min and 5 min and severe fetal acidemia (umbilical artery blood pH≤7.00) were significantly more common in association with meconium stained AF group.

The incidence of meconium aspiration syndrome (MAS) and respiratory distress were significantly increased in those with MSAF. Deaths were significantly increased ($P<0.001$) in those infants diagnosed to have

Table 3 Perinatal morbidity and mortality in relation to control (clear AF) or meconium stained amniotic fluid (MSAF)

Outcome	Control group *n*=400		Meconium (Study group) *n*=390		*P*
	n	%	*n*	%	
Apgar Score					
≤3 at 1 min	16	4	47	12[a]	<0.001
≤3 at 5 min	8	2	12	3	<0.003
Severe fetal acidosis umbilical artery blood pH <7.00	2	0.5	4	1[a]	<0.001
Meconium aspiration syndrome (MAS)	0	0	8	2[a]	<0.004
Respiratory distress	16	4	47	12[a]	<0.001
Deaths	1	0.2	4	1[a]	<0.001

[a] *P* for meconium vs control

Table 4 Infants need mechanical ventilation and oxygen support in relation to clear or with meconium-stained amniotic fluid (MSAF)

	Oxygen support		Mechanical Ventilation	
	n	%	*n*	%
Clear amniotic fluid *n*=400	16	4	3	0.8
Thin meconium stained amniotic fluid (MSAF) (*n*=175)	12	7	4	2.0
Mod- thick meconium stained amniotic fluid and *no suction* (*n*=112)	15	13	16	5.3
Mod-thick meconium with suction (*n*=103)	30	29*	16	15.5*
Infants with meconium and no meconium aspiration syndrome MAS (*n*=382)	57	15	18	4.7
Infants with meconium and MAS (*n*=8)	8	100**	4	50**

*$P<0.01$ VS all others
**$P<0.001$ VS infants with meconium and no (MAS)

MAS. All four neonatal deaths (10 per 1000 births) of infants delivered from meconium stained AF. Two neonatal deaths in infants with meconium aspiration syndrome were attributable to aspiration. The remaining two were attributed to group B streptococcal infection (*n*=1)and unexplained subarachnoid haemorrhage (*n*=1).

Table 4 shows the need for supplemental oxygen or required assisted ventilation in delivery room. We found no differences between the control group, thin MSAF, and moderate to thick MSAF who were selectively not suctioned. Infants selectively suctioned for moderate to thick meconium had significant higher rates of mechanical ventilation and oxygen support ($P<0.01$). Meconium aspiration was significantly increase in those infants who required ventilator support ($P<0.001$).

Discussion

Many theories have been suggested to explain meconium passage in the amniotic fluid [4, 16, 17, 20].

Intrauterine passage of meconium may represent a normal physiologic event for the term fetus.

The pathologic explanation proposes the fetus's pass meconium in response to chronic hypoxia or decreased placental perfusion. Meconium passage could also occur due to vagal stimulation from umbilical entrapment as a direct vasoconstrictor of umbilical and placental vessels. The presence of thick meconium in early labour would be expected to be associated with increasing meconium aspiration, neonatal asphyxia, and adverse neonatal outcome [2, 4].

The incidence of meconium-stained AF varies from 0.5% to 22% to 29% in high risk population [4, 13]. Our 10.13% incidence of meconium-stained AF.

Previous evaluations have used the Apgar score as the measure of asphyxia, and only recently has umbilical artery cord blood pH been used to try to establish a more objective measure of the significance of meconium-stained AF [4, 9, 16, 17, 21]. Recent work [10] using logistic regression techniques to predict a risk model for meconium aspiration found that FHR base line tachycardia increased the risk for severe aspiration 24-fold.

In our study, nearly all measures of adverse neonatal outcome were found more frequently with MSAF.

Our results were similar to other studies [4, 16, 17, 21] with excess perinatal mortality due to meconium was 10 per 1000 births.

In this study umbilical artery blood pH=7.00 was significantly increased with meconium as compared to clear AF. Meconium with Apgar score=3 and cord blood <7.00 were significantly increased compared to clear AF [7, 12].

Admission to Special Care Baby Unit (SCBU) and respiratory distress after birth were significantly more common in the meconium group.

This study showed that meconium significantly increased risks of birth asphyxia, fetal acidemia, and neonatal morbidity and mortality.

Our study demonstrated lower Apgar score, arterial cord pH<7.00, more FHR abnormality, more cesarean delivery, and meconium aspiration syndrome in association with moderate to thick meconium (Table 2). Our results similar to other studies [4, 16, 17, 21]. However, others failed to show a relation between the consistency of meconium and adverse perinatal outcome [14, 18].

In our study, meconium aspiration syndrome (MAS) was significantly associated with fetal acidemia at birth, cesarean delivery, intrapartum FHR abnormalities, lower Apgar scores, and the need for assisted ventilation in the delivery room. Our analysis suggested that the fetal compromise associated with MAS was an acute event similar to Ramin et al. [17] study.

Although controversy exists regarding the significance of meconium-stained AF, our data demonstrate that moderate or thick meconium marks a patient for the risk for adverse neonatal outcome.

The presence of meconium requires reassurance of fetal well-being by acid-base assessment, more electronic fetal monitoring, and less use of oxytocin in labour due to significant increase in cesarean section.

In our study and other similar studies [6, 21] we recommend that infants born through thin MSAF should have suctioning of the mouth and nasopharynx by the obstetrician before the delivery of the shoulders and thorax.

Infants born through moderate to thick MSAF should have suctioning by the obstetrician, and infants who appear have good respiratory efforts do not require tracheal suction by the pediatrician, but the depressed infants should have tracheal suction.

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