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Maternal and fetal outcomes in meconium-stained amniotic fluid deliveries in a tertiary center

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Abstract

Backgrounds and objectives: Meconium -stained liquor could be an alarming sign of fetal distress and needs continuous fetal heart rate monitoring and urgent interventions. The study aimed to determine maternal and fetal outcomes among women presented with meconium-stained amniotic fluid during labor in relation to mode of delivery, rate of caesarian section, Admission to neonatal intensive care unit and neonatal complications and mortality.

Methods: A cross-sectional study was carried out in Duhok Obestetric and Gynecology Teaching Hospital between 1st of September 2019 and 1st of April 2020 where 100 women in labor diagnosed with meconium stained amniotic fluid gestational age between (37_40+6 weeks) included in this study, all participants were meet inclusion criteria for this study and a written consent obtained from them.

Results: The study showed that out of 100 participants with meconium stained liquor 48% of them delivered by lower segment cesarean section and the cause of 76.6% of them was fetal distress .The study showed significant statistical association between meconium stained liquor and lower mean scores of APGAR scores at 1 and 5 min , and rate of neonatal intensive care unit admission which was 74 (74.0%) and neonatal complications rate such as meconium Aspiration Syndrome (31.0%), Respiratory Distress Syndrome (14.0%), and Early Neonatal Death (3.0%) ,the study showed that women with spontaneous rupture membrane and thick meconium were significantly more likely to have infants with meconium aspiration syndrome; 46.2% and 48.1% respectively.

Conclusions: This study showed that women in labor with meconium-stained amniotic fluid had higher fetal and maternal complications.

Keywords: Meconium-stained amniotic fluid; Meconium aspiration syndrome; Maternal outcomes; Fetal outcomes.

Introduction

Meconium is a material accumulating into the fetal bowel during the intrauterine life and released mainly within the first 2 days of age. Meconium passage in a newborn is a developmentally programmed event. The meconium is normally released within the first 24-48 hrs. after birth. Near-term or term intrauterine meconium passage is mostly associated with feto-maternal stress factors such as hypoxia and infection. The incidence rate of meconium-stained amniotic fluid (MSAF) is from 1% to 18%[1]. Meconium-stained liquor is a sign of fetal distress. But, it has been confirmed that the meconium passage is a clinical feature for developing gastrointestinal tract or it is a sign of vagal stimulation owing to umbilical cord compression. Also, a relation among meconium-stained liquor, fetal compromise, and perinatal morbidity is well known[2]. Many of the infants with MSAF have low APGAR scores, more

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acidosis, or clinical illnesses compared to those infants with clear amniotic fluid. The neonatal outcomes between neonates with meconium-stained liquor and clear amniotic fluid in normal fetal heart rates are comparable. The neonates who have abnormal heart rates have a high incidence of morbidities. Hence, the presence of meconium liquor requires continuous monitoring of fetal heart rate and fetal blood sampling[3]. The neonatal and maternal outcomes among MSAF patients has not been investigated in Duhok governorate yet. The study aimed to determine maternal and fetal outcomes among women presented with meconium-stained amniotic fluid during labor in Duhok Obestetric and Gynecology Teaching Hospital to determine the maternal outcomes in relation to mode of delivery and assess the rate of cesarean section due to fetal distress and fetal outcomes in relation to birth asphyxia, Apgar score at 1 & 5 minutes, baby weight and Neonatal Intensive Care Unit NICU admission. In addition, the neonatal characteristics and complications in the NICU were assessed.

Patients and methods

In this cross-sectional study, the women in labor who admitted to the labor room of Duhok Obestetric and Gynecology Hospital were screened for the eligibility criteria. In this study, patients were screened physically, clinically, and transferred for laboratory investigations. The women in labor with meconium-stained amniotic fluid were included in this study. The participants were chosen from Duhok Obstetrics and Gynecology Teaching Hospital /Duhok Governorate /kurdistan region between the 1st of September 2019 and 1st of April 2020. The inclusion criteria were: The women in labor who accepted to participate with gestational age between 37 and 40 weeks+6 days, cephalic presentation, a single baby with no known fetal anomaly, and with meconium-stained liquor following spontaneous or artificial rupture of membranes during labor were included in this study. The exclusion criteria were: The women in labor with a gestational age of less than 37 and greater than 41 weeks, with high-risk pregnancies or pregnancies with severe maternal diseases, any fetal anomalies, antepartum fetal death, intrauterine growth retardation, non-cephalic presentations, placenta Previa, induction of labor, and maternal systemic diseases. The following information was obtained from the participants: maternal age, parity, gestational age, rupture membrane, meconium type (thin or thick), mode of delivery, admission to NICU, and neonatal complications in NICU. The rupture membrane was categorized as spontaneous or artificial rupture membrane and mode of delivery as normal vaginal delivery(NVD), lower segment caesarian section (LSCS) and instrumental delivery. The infants' complications were categorized as meconium aspiration syndrome, respiratory distress syndrome, early neonatal death, and no complications. Thick meconium was defined as thick greenish meconium with particulate substance in amniotic fluid, while thin meconium was defined as light greenish staining of amniotic fluid. Meconium aspiration syndrome was the presence of meconium-stained skin, umbilical cord, or meconium in the trachea at birth, followed subsequently by signs and symptoms of MAS-meconium aspiration syndrome (i.e. dyspnea, tachypnea, retraction, grunting or cyanosis). The characteristics of the patients were presented in Mean ± Standard Deviation (SD) or frequencies (No.) and percentages (%). The mean values of the APGAR score at 1 and 5 min were presented in mean ± SD. The birth weight and asphyxia, NICU admission, and infants' complications, and

emergency delivery causes were determined in frequencies and percentages. Association of maternal and fetal outcomes with the mode of delivery and general characteristics in meconium-stained amniotic fluid deliveries was examined in Fishers' exact test. ANOVA-One way was performed to compare APGAR scores, birth weight, maternal and gestational age in infants with different complications in meconium-stained amniotic fluid deliveries. The significant level was determined in a p-value of < 0.05. The statistical calculations performed by the Statistical Package for Social Sciences software, version 25 (SPSS 25; IBM, USA). The ethical approval of this study was obtained from the Kurdistan Board for Medical Specialties (KBMS).

Results

The mean maternal age of the patients with meconium-stained amniotic fluid during labor was 27.15±6.11 ranged between 17 and 41 years. The mean values of parity and gestational age were 1.75±1.93 and 39.72± 0.97 weeks), respectively. Concerning the rupture membrane, the study revealed that 61.0% of the patients had an artificial rupture membrane, and the remaining 39.0% had a spontaneous type. More than half of the patients had thick meconium (54.0%) in contrast with thin meconium (46.0%), (Table 1).

Table (1): General and clinical characteristics of patients with meconium-stained amniotic fluid during labor**.**

Patients' characteristics (n=100)		
	Mean	**SD**
Maternal age (Range: 17-41 yrs.)	27.15	6.11
Parity (Range: 0-8)	1.75	1.93
Gestational age (Range: 37-41 weeks).	39.72	0.97
	No.	**%**
Rupture Membrane		
Spontaneous	39	39.0
Artificial	61	61.0
Constancy of Liquor		
Thin Meconium	46	46.0
Thick Meconium	54	54.0

The mean values of APGAR scores for 1 and 5 min were 6.57 and 8.48, respectively. The outcomes of the delivery mode were NVD: 50.0%), followed by LSCS: 48.0%), and instrumental delivery (2.0%). The reasons behind LSCS were found mainly to be due to fetal distress (36, 75.0%) failure of the progression (10, 20.8%), obstructed labor (1, 2.1%), and old primigravida (1, 2.1%). The birth asphyxia was found in one infant only (Table 2). The mean value of birth eight was 3.40 _+ (SD: 0.46 Kg). Most of the infants had normal weight (99.0%). Only one infant had low birth weight which defined as birthweight between (1.5_2.5) Kg. No patient was found with very low birth weight which defined as birthweight between (1_1.5 Kg. and very extremely low birth weight which defined as birth weight less than 1 Kg. The study found that 74 (74.0%) were admitted to the NICU. The

complications of infants were Meconium Aspiration Syndrome (31.0%), Respiratory Distress Syndrome (14.0%), and Early Neonatal Death (3.0%) and 52 infants had no complications, Table (2).

Table (2): Maternal and fetal outcomes in meconium-stained amniotic fluid deliveries.

Fetal Outcomes (n=100)		
	Mean	**SD**
APGAR score		
1 min (Range: 2-10)	6.57	1.71
5 min (Range: 3-10)	8.48	1.56
Birth Asphyxia		1.0
Yes	1	99.0
No	99	
Birth weight (Range: 2.3-4.5 Kg)	3.40	0.46
Birth weight	99	99.0
Normal Weight (≥2.5 Kg)	1	1.0
LBW (1.5 -<2.5 Kg)	0	0.0
VLBW (1.0-<1.5 Kg)	0	0.0
VELBW (<1.0 Kg)		
NICU admission		
Yes	74	74.0
No	26	26.0
Complications		31.0
Meconium Aspiration Syndrome	31	14.0
Respiratory Distress Syndrome	14	3.0
Early Neonatal Death	3	52.0
No	52	
Maternal Outcomes	**No.**	**%**
Delivery Mode		
NVD	50	50.0
LSCS	48	48.0
Instrumental delivery	2	2.0
Emergency cesarean section causes		
Fetal distress	36	75.0
Failure of progression	10	20.8
Obstructed labor	1	2.1
Old primi	1	2.1

(LBW-low birthweight, VLBW-very low birthweight. ELBW-extremely low birthweight. NICU -neonatal intensive care unit. NVD-normal vaginal delivery. LSCS-lower segment cesarean section)

The risk factors of cesarean section in meconium-stained amniotic fluid deliveries were fetal distress (76.6%) which mainly occurred due to MSAF and this mean that caesarian section rate increase in cases of MSAF followed by failure to progression (19.1%), obstructed labor (2.1%), and old primigravida 2.1%), (Table 3).

Table (3): Risk factors of cesarean section in meconium-stained amniotic fluid deliveries.

Cesarean section cause (n=100)	LSCS
Fetal distress	36 (76.6)
Failure of progression	9 (19.1)
Obstructed labor	1 (2.1)
Old primi	1 (2.1)

The study showed that patients with spontaneous rupture membrane and thick meconium were more likely to have infants with meconium aspiration syndrome; 46.2%; p-value=0.026 and 48.1%; p-value<0.001, respectively. The patients who delivered by LSCS were likely to have infants with complications (p-value=0.001). The study showed that infants with birth asphyxia and low birth weight were more likely to have complications (p-value =0.030 and p-value <0.001, respectively (Table 4).

Table (4): Association of fetal outcomes to patients' characteristics in meconium-stained amniotic fluid deliveries.

Characteristics (n=100)	Complications no. (%).				p-Value
	Meconium aspiration syndrome	Respiratory distress syndrome	Early neonatal death	No complication	
Rupture Membrane					0.026**
Spontaneous	18 (46.2)	6 (15.4)	0 (0.0)	15 (38.5)	
Artificial	13 (21.3)	8 (13.1)	3 (4.9)	37 (60.7)	
Constancy of Liquor					<0.001**
Thin Meconium	5 (10.9)	3 (6.5)	0 (0.0)	38 (82.6)	
Thick Meconium	26 (48.1)	11 (20.4)	3 (5.6)	14 (25.9)	
Delivery Mode					0.001**
NVD	9 (18.0)	4 (8.0)	1 (2.0)	36 (72.0)	
LSCS	20 (41.7)	10 (20.8)	2 (4.2)	16 (33.3)	
Instrumental delivery	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	
Birth Asphyxia					0.030**
Yes	0 (0.0)	0 (0.0)	1 (100)	0 (0.0)	
No	31 (31.3)	14 (14.1)	2 (2.0)	52 (52.5)	
NICU admission					<0.001**
Yes	31 (41.9)	14 (18.9)	3 (4.1)	26 (35.1)	
No	0 (0.0)	0 (0.0)	0 (0.0)	26 (100)	
Birthweight					1.00***
Normal weight	31 (31.3)	14 (14.1)	3 (3.0)	51 (51.5)	
LBW	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)	
Fishers' exact test was performed for statistical analysis.					

(LBW-low birthweight. NICU -neonatal intensive care unit. NVD-normal vaginal delivery. LSCS-lower segment cesarean section).

The study showed that infants with complications had significantly lower mean scores of APGAR scores at 1 and 5 min (Pp-value<0.001). But, the mean values of maternal age, gestational age, parity, and birth weight were not significantly different in infants with different complications (Table 5).

Table (5): Comparison of APGAR scores, birth weight, maternal and gestational age in infants with different complications in meconium-stained amniotic fluid deliveries.

Characteristics (n=100)	Complications Mean (SD)				p-Value
	Meconium aspiration syndrome	Respiratory distress syndrome	Early neonatal death	No complication	
APGAR 1Min	4.97 0.80	5.93 0.62	3.00 1.00	7.90 0.98	**<0.001**
APGAR 5Min	7.00 0.82	8.21 0.58	5.00 1.73	9.68 0.74	**<0.001**
Birth weight (Kg)	3.52 0.48	3.37 0.33	3.600 0.66	3.33 0.47	0.267
Maternal Age	27.39 7.12	27.14 5.83	29.67 6.66	26.87 5.63	0.884
Gestational Age	39.87 0.99	39.29 1.10	40.00 0.50	39.73 0.93	0.285
Parity	1.87 2.26	1.79 2.08	0.33 0.58	1.75 1.73	0.634
ANOVA-One way was performed for statistical analyses.					

Discussion

This study showed a high incidence of meconium aspiration syndrome and respiratory distress syndrome in patients with MSAF; including thick meconium (54.0%) in this region. The maternal and fetal outcome in the meconium-stained amniotic fluid has been reported in other studies as well. An observational study performed among 1000 pregnant women in India over 14 months. The patients who were included were at 37 weeks of gestation and more with singleton pregnancies and cephalic presentation[4]. The patients were grouped as MSAF (n=350) and with clear liquor as controls (n=650). The incidence rates of thin and thick stained meconium were 55.4% had (44.5%), respectively. Also, 45.7% had fetal heart abnormalities on electronic monitoring with a high rate of fetal tachycardia. In agreement with the present study, the rates of cesarean section were triple in cases compared to the controls. The rate of LSCS was 48.0% in the present study possibly due to study design. Another similar study conducted by Qadir on 300 women including 54 cases with meconium on the spontaneous or artificial rupture of membranes. There was a significant association of MSAF and perinatal outcomes[2]. The incidence of meconium-stained liquor was 18%. We did not report the incidence of MSAF in this study since all of our patients had MSAF. Also, the incidence of maternal outcomes such as LSCS, and failure of progression were higher in patients with MSAF in this region. Qadir showed that fetal heart rate abnormalities are more prevalent in patients with thick meconium (62.5%) compared to thin meconium (15.8%). Besides, there is a significant difference between the APGAR score and MAS. In their study, there was no baby with APGAR>7 had MAS[2]. There was no significant association of maternal outcomes with the mode of delivery in MSAF patients in the present study. But, the incidence rates of LSCS and mode of delivery were higher due to fetal distress which the MSAF. The MSAF patients were more likely to have infants with clinical complications; including meconium aspiration syndrome; respiratory distress syndrome; and early neonatal death. Similar findings were reported in India by Unnisa[4]. In agreement with the present study, there were higher fetal outcomes in patients with lower APGAR scores. Also,

they reported that fetal outcomes were associated with birth asphyxia, meconium aspiration syndrome (MAS), and higher rates of NICU admissions. Similar results to the present study were reported in other studies as well[5-12]. It is important to detect the MSAF during labor because it is contributed to anxiety to healthcare providers and it is correlated to fetal distress[13]. Poor fetal and maternal outcomes have been shown to associate with higher NICU admissions. There are still many unclear questions about the importance of the MSAF and management protocols. It is suggested that the physicians follow the Committee Opinion No 689: Delivery of a Newborn with Meconium-Stained Amniotic Fluid[14]. A meta-analysis study evaluated the effectiveness of intrapartum prophylactic amnioinfusion in pregnancies complicated by the meconium-stained amniotic fluid[3]. They reported that intrapartum amnioinfusion substantially reduces the rate of meconium aspiration syndrome, of meconium below the vocal cords, and neonatal acidemia. The women who receive amnioinfusion have a significantly lower rate of cesarean without increased postpartum endometritis.

Conclusions

The patients with MSAF during labor had higher fetal and maternal complications. Thick meconium is associated with increased operative interventions, low Apgar scores, increased risk of meconium aspiration syndrome, and NICU admissions. Therefore, it is important to identify women with MSAF as early as possible and continuous Intrapartum fetal heart monitoring is needed to reduce perinatal morbidity and mortality. The presence of MSAF requires close monitoring of fetuses with cardiotocography, mindful intervention, and the presence of skilled pediatrician at the time of birth to improve the outcomes.

Conflicts of interest

There were no conflicts of interest.

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