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Meconium Stained Amniotic Fluid- Associated Factors and Perinatal Outcome at Tertiary Care Centre

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Abstract | **Original Research Article**

Background: Meconium staining of the amniotic fluid has long been regarded as a sign of foetal distress. 12-20% deliveries are complicated by meconium staining of the liquor. Presence of meconium increases the risk of operative deliveries, admission to the neonatal ICU, and 5-minute Apgar score of ≤7. With improvement in antenatal and intranatal monitoring in today's practice, neonatal outcome has improved in deliveries complicated by meconium stained liquor. This study was aimed at determining factors associated with meconium staining amniotic fluid and perinatal outcomes. ***Methods:*** This was a prospective study conducted in the Department of Ob-GY, S.M.S. Medical College, and Jaipur from January 2018 to June 2018. The study included 200 women with meconium stained amniotic fluid in labour with gestational age >37 completed weeks. Data were collected and analysed to find associated factors for meconium and perinatal outcome. ***Results:*** Incidence of meconium was 11.5%. Non-reassuring foetal heart rate pattern was observed in 34.5% of the cases. Women who had grade 3 meconium stained liquor were 6 times more likely to have caesarean section compared to the women with grade 1 meconium stained liquor Low fifth minute Apgar score, admission to NICU and operative deliveries were significantly more with grade 3 MSAF. ***Conclusions:*** Meconium stained amniotic fluid was associated with higher rate of cesarean delivery with increased perinatal morbidity and mortality. Therefore identification of pregnant woman at risk of passage of meconium during labour would allow intensive foetal heart monitoring and early intervention so as to reduce adverse neonatal outcome.
Keywords: Cancer, depression, counseling, palliative care.

INTRODUCTION

Meconium is viscous, sticky and odourless dark olive green stool composed of materials ingested during intrauterine period, intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile and water. Meconium is normally retained in the infant's bowel until after birth [1, 2]. Meconium staining of the amniotic fluid has long been regarded as a sign of foetal distress. The exact cause of passage of meconium in amniotic fluid prior to birth is not known, but it is believed that it results from neural stimulation of a maturing gastrointestinal (GI) tract or due to acute or chronic foetal hypoxic stress. As the foetus approaches term, the GI tract matures, and vagal stimulation from head or spinal cord compression may cause peristalsis and relaxation of the rectal sphincter, leading to meconium passage [3].

Approximately 12-20% of deliveries are complicated by meconium staining of the liquor [4] and meconium aspiration syndrome may complicate up to 5% of birth. Early studies reported that the incidence of meconium aspiration syndrome (MAS) could be reduced by oropharyngeal suctioning (ONPS) following delivery of the foetal head, but before delivery of the chest.

Meconium stained liquor is associated with maternal as well as foetal risks. Maternal risks are meconium-laden amnionic fluid embolism [5], puerperal metritis with meconium-stained amnionic fluid is increased two- to four fold and increased risk of operative deliveries [6]. It was also found that MSAF was a significant predictor for other perinatal complications (admission to the neonatal ICU, and 5-minute Apgar score of ≤7) [6-9].

With improvement in antenatal and intranatal monitoring in today's practice, neonatal outcome has improved in deliveries complicated by meconium stained liquor.

Although maternal and perinatal outcomes in MSAF were well studied in the developed countries, very little is known about the situation in the developing countries including India. This study was therefore, aimed at determining factors associated with MSAF and perinatal outcomes.

MATERIALS AND METHODS

This prospective observational study was carried out in the Department of Obstetrics and Gynaecology, S.M.S. Medical College, Jaipur over a period of six month from January 2018 to June 2018.

Inclusion criteria: all pregnant women with with meconium stained amniotic fluid (MSAF) detected after spontaneous or artificial rupture of membranes, who had gestational age 37 weeks or more, with singleton pregnancy and cephalic presentation, with no known foetal congenital anomalies were included after obtaining informed written consent. A total 200 women with MSAF were enrolled in the study.

The women were carefully watched for progress of labour and they were strictly monitored for foetal heart rates by doing intermittent auscultations. Presence of meconium after spontaneous or artificial rupture of membrane was followed by cardiotocography for 20 minutes. Mode of delivery was decided, considering all obstetric conditions. Foetal outcome in terms of Apgar score at 1 minute and at 5 minutes, birth weight, neonatal intensive care admission (NICU), birth asphyxia, meconium aspiration syndrome (MAS) and early neonatal death (death within seven days of birth), were noted.

Data were entered in MS excel sheet and analysed statistically. Logistic regression analysis was conducted to identify statistical association between measures of maternal and foetal outcome. A p value of <0.05 was considered as significant.

RESULTS

Of the 1740 deliveries during the study period, 200 (11.5%) labouring mothers with meconium stained amniotic fluid (MSAF) fulfilled the inclusion criteria. Most of them (89.5%) were below 30 years. Mean age of the women was 24.85±1.68 years. 53.5% women were lliterate, 90.5% of them were housewives and 86.5% of the women were para 1-4. Non-reassuring foetal heart rate pattern (NRFHP) was observed in 34.5% of the cases. About 42% percent of the foetuses were delivered within 30 minutes of detecting the NRFHP while 6.5% foetuses were delivered in more than 60 minutes (Table 1).

Out of 39 (19.5%) women who had antepartum obstetric complications, 23 (11.5%) were diagnosed to have hypertensive disorders of pregnancy and 4.5% had prolonged pregnancy. 91.5% women had no medical illness during current pregnancy. Onset of labour was spontaneous in 175 (87.5%) of the cases and in remaining 25 cases (12.5%), labour was induced for sever preeclampsia (7.5%), Post term pregnancy (3%) and PROM (2%) . 31.5% of the cases had rupture of membrane before the onset of labour and it was prolonged for more than 12 hours in 30.5% of cases. In 16% of the cases, diagnosis of MSAF was made during latent phase of labour and the remainder was identified during active first stage of labour. In 120 (60%) of the cases liquor was either grade 2 or grade 3 meconium stained. Caesarean section was done in 144 (72%) of the cases (Table 2).

The most common indication for caesarean section was NRFHP (30.5%) followed by CPD (15.5%) (Table 3). Table 4 shows mode of resuscitation of the newborn. After birth, drying and rapping was done for 52% of the new-borns, nasopharyngeal suctioning (ONPS) was done in 29.5% of the cases in addition to drying and rapping and in 18.5% bag mask ventilation was given after ONPS was done.

Logistic regression analysis revealed that women who had grade 3 meconium stained liquor were 6 times more likely to have caesarean section compared to the women with grade 1 meconium stained liquor (OR=6.44, 95%CI:2.48-16.69, p= 0.0001). Women with intrapartum NRFHP had 4 times increased risk of caesarean section when compared with those with reassuring foetal heart rate pattern liquor (OR=4.4, 95%CI:1.94-9.99, p= 0.0004). Primiparous women had 3 fold increased risk for caesarean section compared to multiparous women (OR=3.22, 95%CI: 1.68-6.19, p= 0.0004). Women who had rupture of membrane for more than 12 hours had 2 fold increase risk for caesarean section compared to women who had rupture of membrane for less than 12 hours (OR=2.17, 95%CI:1.03-4.57, p= 0.04). Women with prolonged labour for 20 hours or more had 2.78 times risk for caesarean section as compared to women with shorter duration of labour (OR=2.78, 95%CI:1.16-6.66, p= 0.02).(Table 5)

Women who had NRFHP had approximately 3 times more risk of having 5 min APGAR score less than 7 as compared to women with reassuring FHP (OR=2.94, 95% CI 1.47-5.92, p= .002). Women with both grade 2 and grade 3 meconium had 4 times more risk of having 5 min APGAR score less than 7 as compared to women with grade 1 meconium. Similarly requirement of nasopharyngeal suction was 7 times more for newborn with APGAR score less than 7 (OR=6.58, 95% CI 2.86-15.14, p= <.0001) and risk of

low APGAR score was 3.5 times more for babies delivered by caesarean section (OR=3.53, 95% CI 1.31-9.51, p=.01). (Table 6)

Table 7 shows that babies born by caesarean section, with APGAR score less than 7 and who required nasopharyngeal suction had more risk of NICU admission.

Low fifth minute Apgar score, admission to NICU and operative deliveries were significantly more with grade 3 MSAF (Table 8).

Table-1: Characteristics of labouring mothers with MSAF

Baseline characteristics of the participants (n=200)		Frequency	%
Age	≤30	179	89.5
	>30	21	10.5
Educational status	Illiterate	93	46.5
	Literate	107	53.5
Occupation	Non-Working	181	90.5
	Working	19	9.5
Parity	≤ 4	173	86.5
	>4	27	13.5
Intrapartum foetal heart rate pattern	Reassuring	131	65.5
	Tachycardia	22	11.0
	Bradycardia	34	17.0
	Late deceleration	13	6.5
Duration of NRFHP before delivery in minutes (n=69)	<30	29	42.0
	30 – 60	31	44.9
	>60	9	13.1
Gestational age in weeks	37-39	161	80.5
	≥39	39	19.5

Table-2: Antepartum factors associated with MSAF

Maternal conditions		Frequency	%
Antepartum obstetrics complications	Hypertensive disorders of pregnancy	23	11.5
	Prolonged pregnancy	9	4.5
	Others	7	3.5
Medical illnesses during the current pregnancy	No	183	91.5
	Yes	17	8.5
Indications for induction of labour	Preeclampsia	15	7.5
	Post term pregnancy	6	3.0
	Others	4	2.0
Time of Rupture of membranes	After the onset of labour	137	68.5
	Before the onset of labour	63	31.5
Stage of labour at diagnosis of MSAF	Latent phase of first stage of labor	32	16.0
	Active phase of labour	168	84.0
Duration of ROM* before delivery	<12hrs	139	69.5
	≥12 hrs	61	30.5
Mode of delivery	Vaginal Delivery	56	28.0
	LSCS	144	72.0
Length of labour	<20 hrs	152	76.2
	≥20 hrs	48	24.0
Grade of meconium	Grade 1	80	40.0
	Grade 2	59	29.5
	Grade 3	61	30.5

Table-3: Indications of caesarean section

Indications of caesarean section (n=144)	Frequency	Percentage
NRFHP	61	30.5
CPD	31	15.5
Prolonged second stage	12	6.0
Malpresentation	9	4.5
PROM	12	6.0
Severe Preeclampsia	11	5.5
others	8	4.0

Table-4: Mode of newborn resuscitation

Mode of newborn resuscitation	Frequency	Percentage
Drying & rapping	104	52
Nasopharyngeal suction, drying, rapping	59	29.5
Nasopharyngeal suction, drying, rapping, bag mask ventilation	37	18.5

Table-5: Independent predictors for mode of delivery with MSAF

Variables		Mode of delivery		OR (95% CI)	p value
		VD No (%)	LSCS No (%)		
Foetal heart rate pattern	Reassuring (131)	48 (36.6)	83 (63.4)	1	
	Nonreassuring (69)	8 (11.6)	61 (88.4)	4.4 (1.94-9.99)	0.0004
Degree of meconium	Grade 1 (80)	33 (41.3)	47 (58.7)	1	
	Grade 2 (59)	17 (28.8)	42 (71.2)	1.73 (0.84-3.56)	0.13
	Grade 3 (61)	6 (9.8)	55 (90.2)	6.44 (2.48-16.69)	0.0001
Parity	Multiparous (95)	38 (40.0)	57 (60.0)	1	
	primipara (105)	18 (17.1)	87 (82.9)	3.22 (1.68-6.19)	0.0004
Duration of rupture of membrane	<12 hrs (139)	45 (32.4)	94 (67.6)	1	
	≥12 hrs (61)	11 (18.0)	50 (82.0)	2.17 (1.03-4.57)	0.04
Duration of labour	<20 hrs (152)	49 (32.2)	103 (67.8)	1	
	≥ 20 hrs (48)	7 (14.6)	41 (85.4)	2.78 (1.16-6.66)	0.02

Table-6: Independent predictors for 5th minute Apgar score among neonates Born with MSAF

Variables		5 min APGAR score		OR (95% CI)	p value
		<7 (n=42) No. (%)	≥7 (158) No. (%)		
Foetal heart rate pattern	Reassuring (131)	19 (14.5)	112 (85.5)	1	0.002
	Nonreassuring (69)	23 (33.3)	46 (66.7)	2.94 (1.47-5.92)	
Degree of meconium	Grade 1 (80)	7 (8.8)	73 (91.2)	1	
	Grade 2 (59)	18 (30.5)	41 (69.5)	4.58 (1.77-11.88)	.001
	Grade 3 (61)	17 (27.8)	44 (72.2)	4.03 (1.55-10.49)	.004
New born resuscitation	without oropharyngeal suction (104)	8 (7.7)	96 (92.3)	1	<.0001
	with oropharyngeal suction (96)	34 (35.4)	62 (64.6)	6.58 (2.86-15.14)	
Mode of delivery	VD (56)	5 (8.9)	51 (91.1)	1	0.01
	LSCS (144)	37 (25.7)	107 (74.3)	3.53 (1.31-9.51)	

Table-7: Independent predictors for NICU admission in neonates born with MSAF

Variables		NICU admission		OR (95% CI)	p value
		Yes	No		
Mode of delivery	VD (56)	11 (19.6)	45 (80.4)	1	0.06
	LSCS (144)	49 (34.0)	95 (66.0)	2.11(1.00-4.44)	
5th minute APGAR score	≥7 (158)	33 (20.9)	125 (79.1)	1	<.0001
	<7 (42)	27 (64.3)	15 (35.7)	6.82 (3.26-14.27)	
New born resuscitation	without oropharyngeal suction (104)	13 (12.5)	91 (87.5)	1	
	with oropharyngeal suction (96)	47 (48.6)	49 (51.4)	6.82(3.26-14.27)	<.0001

Table-8: Comparison of different grades of MSAF as a predictor of obstetrics outcome among women with MSAF

Variables	Grade 1		Grade 2		Grade 3		p value
	No.	%	No.	%	No.	%	
5th minute APGAR score <7 (42)	7	16.7	18	42.9	17	40.4	.002
Admission to NICU (n=60)	7	8.8	26	44.1	27	44.3	<.00001
Operative Deliveries (n=144)	47	32.6	52	36.1	45	31.3	.002

DISCUSSION

The rate of meconium-stained amniotic fluid varies from 12 to 20% [4]. The incidence of meconium stained amniotic fluid in our study was 11.5% which was lower than that observed by and Sankhyan Naveen *et al.* [10]. Swain *et al*. [11] and Sori DA *et al*. [12] and higher than 9.8% observed by Firdaus U *et al*.[13].

In our study majority of the women with meconium stained amniotic fluid were below 30 years with a mean age of 24.85±1.68 years. Our results were consistent with that of Vaghela HP *et al*. [14] who in their study observed that majority of the patients (74%) were in the age group of 21 to 30 years. Mean age of the women in our study was 24.85±1.68 years which was similar to that observed by Sankhyan Naveen *et al*. [10] (24.9±3.8 years) and lower than that observed by Neke Akhtar *et al*. [15] (26.2±5.2 years).

Non reassuring foetal heart pattern was seen on CTG in 34.5% cases. The findings of NRFHP in our study were higher than that reported by Odongo BE *et al*. [16]. Kumari S *et al*. [17] Vaghela HP *et al*. [14] and Qadir S *et al*.[18].

In our study hypertensive disorders of pregnancy was associated with MSAF in 11.5% women while a higher incidence was observed in studies done by Rajlaxmi Mundhra, Manika Agarwal [19] and Qadir S *et al*. [18]. MSAF in hypertensive disorders of pregnancy is due to utero placental insufficiency, which causes foetal hypoxia and passage of meconium.

In our study 40% patients had thin meconium, 29.5% had moderate and 30.5% had thick meconium. Our results were similar to that observed by Vaghela HP *et al*. [14], Erum Majid Sheikh *et al*. [20] and Piper *et al*.[21].

LSCS was done in 72% of the women with MSAF in our study. The caesarean rates were comparable to that observed by Vaghela HP *et al*. [14] and Sori DA *et al*. [12]. Our results were very high as compared to other studies done by Becker S *et al*. [5] and Desai D *et al*. [9], this may be due to high rate of CPD and prolonged labour in our study.

APGAR score 7 or less was seen in 8.8%, 30.5 and 27.8% of newborn with grade 1, grade 2 and grade 3 meconium stained amniotic fluid respectively. Our results were in consistent with that observed by Vaghela HP *et al*.[14].

Women who had grade 3 meconium stained liquor were 6 times more likely to have caesarean section compared to the women with grade 1 meconium stained liquor. Women with intrapartum NRFHP had 4 times increased risk of caesarean section when compared with those with reassuring foetal heart rate pattern liquor. Primiparous women had 3 fold increased risk for caesarean section compared to multiparous women. It was also observed that babies born by caesarean section, with APGAR score less than 7 and required nasopharyngeal suction had more risk of NICU admission. Similar observations were made by Nirmala *et al*. [22], Meena Priyadharshini.V and Seetha Panicker [3], Qadir S *et al.* 18 and Sori DA *et al*. [12]

The thickness of MSAF was found to be an important predictor of low fifth minute Apgar score, admission to NICU and operative deliveries in this study. Our results were comparable with study done by Sori DA *et al*. [12].

Presence of meconium in absence of foetal heart rate abnormalities is not suggestive of foetal compromise and does not require any intervention. After the initial hypoxic bout initiating the passage of meconium, subsequent repetitive bouts due to prolonged labour or abnormal uterine activity may cause severe asphyxia [3]. Such repetitive bouts can be avoided by careful foetal monitoring, active management of labour and optimal care after birth. This would help avoid unnecessary caesarean sections in all cases of meconium stained liquor in absence of a definitive indication.

CONCLUSION

From this study it is evident that meconium staining of amniotic fluid is a commonly observed phenomenon and its presence along with foetal heart abnormalities is associated with increased perinatal morbidity and mortality. Therefore identification of pregnant woman at risk of passage of meconium during labour would allow intensive foetal heart monitoring and early intervention so as to reduce adverse neonatal outcome.

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