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IMMEDIATE CLINICAL OUTCOME OF NEWBORNS WITH MECONIUM-STAINED AMNIOTIC FLUID IN A TERTIARY CARE HOSPITAL

Paediatrics

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ABSTRACT

Introduction: Meconium-stained amniotic fluid is one of the risk factors to increase the rate of perinatal morbidity and mortality. The incidences of admission to NICU with various neonatal disorders were higher in pregnancies complicated by MSAF. **Aim:** To find out immediate clinical outcome of newborns with meconium-stained amniotic fluid in a tertiary care hospital. **Materials and Methods:** Observational descriptive study included 250 infants with MSAF who were admitted in the tertiary care hospital from September 2020 to September 2022. A detailed history was taken for the neonates to detect the aetiology of MSAF, type of delivery and any complications post-delivery. All the clinical assessment, lab investigations & given treatments were noted for the subjects as and when required. **Results:** MSAF neonates were found to be distributed in 70% with thin meconium and 30% of thick meconium. Birth weight across thin grade were comparatively higher than that thick meconium babies. there was no significant difference in the Apgar scores at 1and 5 minute ($p > 0.05$) however significant difference has been seen in the Apgar scores at 10 minute ($p < 0.05$). Thick MSAF was common among 28% non-vigorous babies and it was found to be statistically significant ($p < 0.05$). Emergency LSCS as a mode of delivery was seen in 24.8% cases of meconium-stained liquor. Neonates with thick meconium required more resuscitation as compared to thin meconium babies and difference was seen statistically significant ($p < 0.05$). Severity of MAS has been observed more in thin meconium than thick meconium and its significantly associated ($p < 0.05$) Most common complication seen in neonates was convulsion followed by PPHN. Death rate among MSAF neonates was 6.4% out of which 75% were with thick meconium. **Conclusion:** Severity of MAS has been observed more in thin meconium as compared to thick meconium. The mortality related to the MSAF was 6.4%. Some infant may not develop respiratory distress at birth but developed later hence preventive measures like timely evaluation of high-risk factors, and close monitoring of MSAF infants can be taken to minimise the mortality and morbidity rates.

KEYWORDS

Meconium-stained amniotic fluid (MSAF), meconium, neonates

Introduction:

Meconium-stained amniotic fluid (MSAF) is one of the risk factors to increase the rate of perinatal morbidity and mortality. [1] Meconium is a germ-free, thick, black-green, odourless mate rial which is first recognized in the fetal intestine around 12 weeks of gestation and stores in the fetal colon throughout gestation. [2,3] Passage of meconium in the newborn infants is a developmentally automated incident which occurs within 24 to 48 hours after birth normally. However, the fetus may pass meconium in the amniotic fluid during pregnancy due to different reasons. Meconium passage is rare before 34 weeks of gestation and incidence increases steadily beyond 37 weeks of gestation. [4, 5]

Although 69% of newborns pass meconium by 12 hours of age, many infants pass meconium prior to birth as well. It has been suggested that the foetus passes meconium in response to hypoxia and that meconium therefore signals fetal compromise. Alternatively, in utero passage of meconium may represent normal gastrointestinal tract maturation under neuronal control. Meconium passage could also follow vagal stimulation from transient umbilical cord entrapment. [6,7] Incidence of meconium passage into the amniotic cavity is seems to be increased along with feto-maternal stress factors such as hypoxia and infection, independent of fetal maturation. Factors such as placental insufficiency, maternal hypertension, pre-eclampsia, oligohydramnios or maternal drug abuse (tobacco or cocaine) also result in, in-utero passage of meconium. [8]

Meconium aspiration syndrome (MAS) is defined as a respiratory distress that develops shortly after birth, with radiographic evidence of aspiration pneumonitis and presence of meconium-stained amniotic fluid. [9] MAS occurs in about 5% of deliveries with meconium-stained amniotic fluid and death occurs in about 12% of infants with MAS. [10] MAS is respiratory distress in an infant born through MSAF whose symptoms otherwise cannot be explained. [11] It leads to poor lung compliance, hypoxemia leading to respiratory distress with complications like respiratory failure, pulmonary air leaks and persistent pulmonary hypertension of the newborn. One-third of infants require intubation and mechanical ventilation. [12,13] and newer neonatal therapies like high frequency ventilation, inhaled Nitric Oxide and surfactant administration. [14,15] The incidence of MAS, morbidity and mortality varies among countries.[15] The predictive value of meconium is better when it occurs in high-risk patients and is thick, dark and tenacious. Lightly stained meconium has a poor correlation with fetal hypoxia. Meconium-stained amniotic fluid occurrence during labour is associated with increased caesarean section rate. [16]

As it is severe life-threatening illness of neonates and it needs a good understanding of the circumstances where these events occur. Hence present study was aimed to determine immediate clinical outcome of newborns with meconium-stained amniotic fluid.

Methodology:

The present study was a prospective observational study conducted for the period of 02 years from September 2020 to September 2022 after taking necessary approvals by the Ethics Committee.

Inclusion & exclusion criteria:

All full term and post term live neonates delivered at tertiary centre with meconium-stained amniotic fluid were included in the study. Exclusion criteria were congenital airway and pulmonary anomalies, neonatal surgical emergencies, congenital heart disease, neonates with congenital infections, neonates with inborn error of metabolism, neonates with early onset sepsis and patients not willing and refused to give consent.

After applying inclusion and exclusion criteria and after taking written valid informed consent, 250 neonates with MSAF were recorded in the study. All neonates were followed up to 7 days in NICU/Neonatal Ward or asked for a follow up visit on the 7th day at neonatal OPD in

the same hospital. A semi-structured questionnaire was prepared. Informed written consent was taken from all participants before enrolment.

A detailed history of all liveborn neonates like gender, birth weight (BW), birth length (BL), birth head circumference (HC), weeks of gestation (WG), APGAR scores at 1, 5 and 10 minutes after birth, mode of delivery, born through MSAF, need of active delivery room resuscitation and tracheal suctioning, meconium presence below the vocal cords was recorded.

Mode of delivery of baby noted, whether is a labour natural, emergency or elective LSCS or via forceps delivery. If delivered through LSCS, indication for LSCS was noted. Antenatal USG if done noted, with particular mention of amniotic fluid index whether had oligohydramnios or not. The placenta is examined for calcifications. Intrapartum fetal monitoring (CTG) if done was noted for any fetal heart rate variability. Grading of meconium done either as thin or thick meconium. Type of baby noted as either vigorous or non-vigorous baby. Type of resuscitation done for these babies are noted in terms of routine initial steps of resuscitation or required tracheal toileting, bag-mask ventilation or intubation. Clinical data of the meconium-stained neonates in NICU like diagnosis and severity of MAS, chest X-ray findings, need for mechanical ventilation, need for surfactant treatment, NICU stay and survival was recorded. Hospital antepartum management protocol for MSAF is conventional therapy, and routine prophylactic amnioinfusion for the dilution of MSAF is not performed.

Statistical analysis:

Data was entered in windows excel format. Frequency tables and measures of central tendency (mean) and measures of dispersion (Standard deviation) were obtained by using the statistical package SPSS software. Outcome variables with a p-value less than 0.05 were selected and cross-tabulation was done to determine the strength and direction of the association between MSAF and each outcome variable. Chi-square test was used to check statistical associations between MSAF and outcome variables and covariates.

Observations and Results:

Out of 250 neonates with MSAF 60% were male and 40% of their counterpart. 68.8% neonates were having weight above 2500 gm and majority of women (59.6%) were between 36 to 39 weeks of gestation. Almost 69% babies were having birthweight of above 2500gm. Also 80% babies have completed their gestational age above 36 weeks. (table 1)

Table No. 1: Distribution of study subjects with respect to various parameters

Parameter		Count
Gender	Male	150 (60)
	Female	100 (40)
Weight of baby (gm)	<2000	30 (12)
	2000 to 2500	48 (19.2)
	>2500	172(68.8)
Gestational age (weeks)	<30	02 (0.8)
	30.1 to 33	12 (4.8)
	33.1 to 36	35 (14)
	36.1 to 39	149 (59.6)
	>39	52 (20.8)

Total 250 neonates were found to be distributed with type of meconium and 70% neonates were with thin meconium and 30% of thick meconium. The incidence of thin meconium is more when compared to thick meconium. (Table 2)

Table No. 2: Distribution of study subjects according to meconium

Type of meconium	Count
Thin	176(70)
Thick	74 (30)
Total	250

Number written parenthesis is about percentage

Birth weight across thin grade of meconium babies were comparatively higher than that thick meconium babies. Difference of birthweight with grades of meconium was not statistically significant ($p > 0.05$) Similarly, there was no significant difference in the Apgar scores at 1 minute ($p > 0.05$) and at 5 min ($p > 0.05$) however significant difference has been seen in the Apgar scores at 10 minute ($p < 0.05$). (Table 3)

Grades of meconium and gestational age were not significantly associated ($p>0.05$) Of the 250 cases of meconium-stained liquor, 180 (72%) cases are vigorous babies and 70 (28%) are non-rigorous. Out of 70 babies who were non-vigorous, most of them (91.43%) had thick meconium- stained liquor when compared to 5.55% among vigorous babies. So thick meconium-stained amniotic fluid was more common among non-vigorous babies. This was found to be statistically significant ($p < 0.05$).

Emergency LSCS as a mode of delivery was seen in 62 (24.8%) cases of meconium-stained liquor. Among these, 17 cases (27.41%) were delivered through emergency LSCS with thick meconium. Thick meconium-stained amniotic fluid was not statistically significantly common in LSCS cases ($p > 0.05$). Majority of patients with thin meconium had normal delivery.

Table No. 3: Distribution of study subjects according to meconium

Comparison of grades of meconium in various parameters				
Parameters		Grades of meconium		p value
		Thin	Thick	
Weight of baby				
Weight of baby (gms)	<2000	23	7	0.3711
	2000 to 2500	33	15	
	>2500	120	52	
Gestational age				
Gestational age (wks)	<30	1	1	0.3854
	30.1 to 33	5	7	
	33.1 to 36	29	6	
	36.1 to 39	103	46	
	>39	33	19	
Type of baby delivered				
Type of baby	Vigorous	170	10	0.0001*
	Non-Vigorous	6	64	
Delivery				
Mode of delivery	NVD	131	57	0.3947
	LSCS	45	17	
Resuscitation required				
Type of resuscitation	O2	24	60	0.0001*
	CPAP	19	67	0.0001*
	Intubation	11	16	0.0007*
	Stimulation	74	10	0.0001*
	B & M	20	21	0.0014*
	NA	28	6	0.1102
APGAR score	176	180		
At 1 min	0 to 3	71	30	0.2613
	4 to 6	82	36	
	7 to 10	23	8	
At 5 min	0 to 3	13	9	0.2657
	4 to 6	64	28	
	7 to 10	99	37	
At 10 min	0 to 3	0	0	0.0261*
	4 to 6	48	31	
	7 to 10	128	43	
Severity of MAS				
Severity of MAS	mild	148	17	0.0001*
	moderate	21	26	
	severe	7	31	

Number written parenthesis is about percentage

APGAR score was higher in thin meconium type as compared to thick meconium in all neonates. But type of meconium did not associate with the Apgar score at 1 minute or 5 minutes in our study. ($p>0.05$)

24% babies with thick meconium required O2 where 10% babies with thin meconium required O2. Also, it was observed that 27% with thick meconium required CPAP where 8% babies with thin meconium required CPAP. However, 4% with thick meconium required stimulation while 30% babies with thin meconium required stimulation. Of the 250 cases of MSAF, neonates with thick meconium required more resuscitation as compared to thin meconium babies and difference is seen statistically significant ($p < 0.05$).

Grade of meconium affected the severity of (MAS) Meconium aspiration syndrome ($p = 0.0001$). Mild syndrome was seen more in thin meconium neonates (59%) as compared to thick meconium neonates (07%) 66% mild MAS and 15.2% severe MAS has been observed among 250 neonates. Severity of MAS has been observed more in thin meconium as compared to thick meconium and its significantly associated ($p < 0.05$)

Table No. 4: Distribution of study subjects according to meconium grade and complications

Complications of PA	Thin Meconium	Thick Meconium	p value
AKI	16	8	0.0001
Convulsion	46	8	0.0001
Shock	7	2	0.0034
DIC	8	4	0.0073
HIE	18	2	0.0001
PPHN	10	18	0.5108
Respiratory	8	2	0.0012
distress			
NAD	98	45	0.4862

AKI: Acute Kidney Injury, DIC: Disseminated Intravascular Coagulation, HIE: Hypoxic- ischemic encephalopathy, NAD: No Abnormality Detected, PPHN: Persistent pulmonary hypertension

In 250 MSAF cases, 35 (14%) had PIH as a complication in their mother. Of which, 30 (12%) had thin meconium staining. 28cases had anaemia as an antenatal risk, of which 7 (03%) had thin meconium and 21 (8%) had thick meconium. The most common complication seen in both the groups was convulsion (21.6%) of the new born which was 18% in thin and 03% in thick meconium group. Also 11.2% PPHN has been observed as complication of PA. (table 4)

Out of 250 cases, 16 (6.4%) deaths occurred among MSAF neonates and 93.6% were got discharged. Out of 16 deaths, 12 (75%) cases are with thick meconium. (table 5)

Table No. 5: Distribution of study subjects according to outcome and type of meconium.

Outcome	Thin Meconium	Thick Meconium	p value
Discharged	164 (66)	70 (28)	0.0004
Death	04 (05)	12 (02)	
Total	176 (70)	74 (30)	

Discussion:

In the present study, 60% male neonates were included. Hence male neonates' proportion was more which is similar to the studies by Parveen S et al and Afsar et al. [17,18] This was in contrast to David et al [19] study, in which male babies were less than female babies.

In the present study, amongst all the MSAF cases the incidence of thin meconium-stained amniotic fluid was higher than thick which was similar to the findings of Kashikar S et al [20] & Chhabra et al. [21]

Almost 68.8% babies had a birth weight above 2500 gm. Some studies have reported a similar incidence of birth weight 2501-3500 gm. [21, 22,23] Birth weight of baby and grades of meconium was not significantly associated. ($p > 0.05$)

Majority (75.2%) of MSAF is being delivered through a normal vaginal way which is similar to the study of Holtzman BR et al [24], where the indication of LSCS for fetal distress was only 10.5% whereas it was found low in the study of Gupta V et al [25] where 48.38% LSCS in MSAF group was indicated.

APGAR score was higher in thin meconium type as compared to thick meconium in all neonates. But type of meconium did not associate with the Apgar score at 1 minute or 5 minutes in our study. ($p>0.05$) Kashikar S. e tal [20] and Starks et al [26] also had same observations. Greater incidence of APGAR score below 7 at 1 minute was seen however more incidence was seen above 7 at 5 minute and 10 min in our study. Gupta et al reported that Apgar score (<3) at 1 minute was significantly greater (27%) in those with thick meconium.[25] however low APGAR score has been seen below 7 at 1 minute in study of klufio et [27]

15.2% MAS has been observed severe among 250 neonates in this study. In study of Cleary GM, e tal [10] MAS occurs in about 5% of deliveries with meconium- stained amniotic fluid and death occurs in about 12% of infants with MAS.

The most common complication seen in both the groups was convulsion of the new born which was 18% in thin and 03% in thick meconium group. This difference of incidence of complications in thick and thin meconium was statistically significant ($p< 0.05$).

Out of 16 deaths, 12 (75%) cases are with thick meconium. This morbidity with thick meconium is similar to the study of Narang A r et al. [28]

Conclusion:

Majority of patients with thin meconium had normal delivery. Severity of MAS has been observed more in thin meconium as compared to thick meconium and its significantly associated.

The mortality related to the MSAF was 6.5%. Some infant may not develop respiratory distress at birth but developed later hence the close respiratory distress monitoring is needed for the all infants born through MSAF. Timely evaluation of antenatal and intrapartum high-risk factors associated with MSAF provides early prediction of untoward events in order to avoid birth asphyxia, MAS and its complications.

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