https://doi.org/10.22502/jlmc.v8i1.314

Original Research Article

Risk Factors and Perinatal Outcome of Meconium Stained Amniotic Fluid

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ABSTRACT:

Introduction: Meconium Stained Amniotic Fluid (MSAF) is a frequent finding during deliveries and is a cause for perinatal morbidity and mortality. Meconium Aspiration Syndrome (MAS) in neonates is an association in these deliveries with some infants requiring mechanical ventilation. This study was done with the aim of finding the risk factors for MSAF and its perinatal outcome. **Methods:** This was a hospital based, cross-sectional study. All the inborn babies delivered with MSAF were included in the study. Antenatal risk factors and perinatal outcomes like mode of delivery, Apgar score, NICU admission and neonatal morbidities mainly MAS were noted. **Results:** MSAF was seen in 202 (13.6%) neonates out of which 30 (15%) developed MAS. Antenatal risk factors were present in 97 (48%) cases. Mode of delivery was caesarean section in 78 (39%) and instrumental in 25 (13%) cases. Twenty three percent of the neonates required resuscitation at birth while 34% required respiratory support. Morbidities observed were meconium aspiration, pneumonia, septicaemia, perinatal asphyxia, shock, meconium gastritis and persistent pulmonary hypertension. Neonatal mortality amongst all neonates with meconium was 1.5%. **Conclusion:** Meconium stained amniotic fluid leading to aspiration is a significant cause of neonatal mortality and morbidity. Most of the risk factors for MAS are preventable.

Key words: Amniotic fluid, Meconium, Meconium aspiration syndrome

INTRODUCTION:

Meconium Stained Amniotic Fluid (MSAF) complicates delivery in approximately 8-25% of live births.[1] About 5% of neonates born with MSAF develop Meconium Aspiration Syndrome (MAS) and approximately 50% of these infants require mechanical ventilation.[1] Neonates born with MSAF can aspirate meconium into lungs and develop respiratory distress. This may lead to atelectasis, emphysema, pneumothorax, pneumo-mediastinum, pneumo-pericardium, chemical-pneumonitis or may progress to respiratory failure.[2]

MSAF increases the rate of perinatal morbidity (3-5%) and mortality.[3]MAS is a serious and potentially preventable condition. Some of the risk factors for MAS include post-dated pregnancy, Small for GestationalAge (SGA), oligohydramnios, Hypertensive Disease of Pregnancy (HDP), gestational diabetes and maternal drug abuse. This study was therefore done with the aim of finding the risk factors for MSAF and its perinatal outcome in a tertiary care center.

METHODS:

This was a hospital based, descriptive, cross sectional study conducted in Department of Pediatrics, Lumbini Medical College Teaching Hospital (LMCTH) for a duration of six months from 1st January 2019 to 30th June 2019. Ethical

Submitted: 09 February, 2020
Accepted: 25 May, 2020
Published: 02 July, 2020

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How to cite this article:
Chhetri UD, Aryal S. Risk Factors and Perinatal Outcome of Meconium Stained Amniotic Fluid. Journal of Lumbini Medical College. 2020;8(1):77-82. DOI: https://doi.org/10.22502/jlmc.v8i1.314 Epub: 2020 July 02.

approval was obtained from the Institutional Review Committee of the institute (IRC-LMC). The objective of the study was to find out the rate of MSAF and MAS, analyze maternal and neonatal risk factors, mode of delivery and neonatal morbidity and mortality in MSAF among women delivering at LMCTH.

Sample size was calculated using the formula: $N= z(1-\alpha/2)^2 * p(1-p)/d^2$.

Taking the incidence of meconium (p) as15%,[4] the minimum sample size required was 196.

All the neonates delivered in the obstetric ward of the hospital with MSAF during the study period were included. Informed consent was taken from the mother after diagnosis of MSAF. The neonates were followed till discharge. Still births, neonates with congenital malformations and, multiple gestations were excluded from the study.

A performa was filled for each case after delivery of the baby by the attending paediatrician or paediatric resident. This included demographic characteristics of the mother and baby, antenatal risk factors like postdated pregnancy, anemia, HDP, diabetes, intrauterine growth retardation, antepartum hemorrhage and oligohydramnios. Need for induction of labour and drugs used for induction were also noted. The phase of labour in which meconium was noted was recorded along with the type of meconium. MSAF was diagnosed as green colored amniotic fluid and thick meconium was described as having a pea soup appearance. Also, the need of resuscitations like orogastric suction, bag and mask ventilation or endo-tracheal intubation was noted along with Neonatal Intensive Care Unit (NICU) management like oxygenation, bubble Continuous Positive Airway Pressure (CPAP) or mechanical ventilation. MAS was diagnosed by the presence of meconium in the amniotic fluid at the time of birth long with respiratory distress.

Data were entered to and analyzed by Statistical Package for Social Sciences (SPSS™) software version 21.0. Results were expressed as frequency, percentage and, mean and standard deviations.

RESULTS:

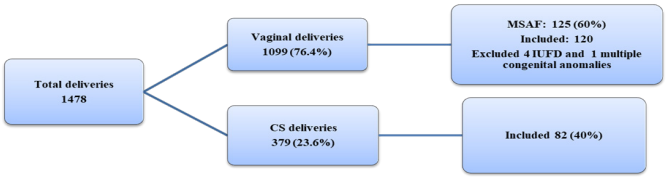

Fig. 1. Total deliveries and case inclusion.

Out of 1478 total deliveries which included 1099 vaginal deliveries and 379 caesarean sections, 207 (14%) cases were with MSAF. Among them, one with multiple congenital anomalies and four with Intra-uterine Fetal Death (IUFD) were excluded and only 202 were selected for the study. MAS was seen in 14.8% of MSAF. Of all MSAF cases, 60% had vaginal delivery and 40% had caesarian section.

Out of 202 pregnant ladies, teenage pregnancy (15-19 years) was 42 (20.7 %) and four (1.9%) were more than 35 years of age (Table 1).

Table 1. Maternal demographic and antenatal characters in MSAF

Parameters		**Frequency N (%)**
Maternal age, in years	15-19	42 (20.7)
	20-24	90 (44.5)
	25-29	49 (24.2)
	30-34	17 (8.4)
	≥35	4 (1.9)
Gravidity	Primigravida	127 (62.9)
	Multigravida	75 (37.1)
Antenatal visit	<4	46 (22.8)
	≥4	156 (73.2)
Labour induction	Yes	94 (46.5)
	No	168 (53.5)
Drugs Used for induction	Misoprostol	60 (29.7)
	Oxytocin	34 (16.8)
Type of Meconium	Thick meconium	89 (44.1)
	Thin meconium	113 (55.9)
MSAF detection	Before onset of labor	20 (9.9)
	Latent phase	94 (46.5)
	Active phase	41 (20.3)
	Second stage	39 (19.3)
	Intra operative	8 (4)

One hundred and eight patients had antenatal risk factors. Hemoglobin was less than 11gm/dl in 28% cases. Four cases had oligohydramnios, five were diabetic. Fifteen developed pre-labor rupture of membrane (Table 2).

Table 2. Antenatal risk factors in cases of MSAF.

Parameters		Frequency N (%)
Antenatal risk factors	Absent	94 (46.5)
	Present	108 (53.46)
Anemia (Hemoglobin<11 gm/dl)		57 (28)
HDP		9 (4.45)
PROM>18 hours		15 (7.4)
Oligohydramnios		4 (2)
Diabetes Mellitus-II		5 (2.47)
Antepartum hemorrhage		5 (2.5)
Intrauterine growth restriction		10 (4.95)
Hepatitis B positive		2 (1)
Others		1 (0.49)

PROM: Prelabor rupture of membranes

Table 3. Clinical profile of babies with MSAF.

Parameters		N	%
Gestation age in weeks	37-38	8	4
	39-40	65	32
	41-42	129	63.8
Mode of delivery	Vaginal delivery	95	47
	Emergency LSCS	78	38.6
	Elective LSCS	4	2
	Vacuum delivery	18	8.9
	Forceps delivery	7	3.5
At Birth	Vigorous	173	85.6
	Non vigorous	29	14.4
APGAR score	<4 at 1 min	13	6.4
	<4 at 5 min	2	1
Birth weight in kg	<2.5	21	10.4
	2-5-3.5	162	80.2
	>3.5	19	9.4
Sex	Male	100	49.5
	Female	102	50.5

Table 4. Resuscitation and respiratory support at birth.

Resuscitation at birth	N	%
None	156	77.2
Orogastric suction	11	5.5
Endotracheal suction	13	6.4
Bag and mask ventilation	17	8.4
Endotracheal ventilation	6	3
More than one technique	4	2
RespiratorySupport		
None	134	66.3
Oxygen via head box/ nasal prongs	43	21.3
CPAP*	22	10.9
Mechanical Ventilation	3	1.5

*Continuous Positive Airway Pressure

One hundred and sixty-two deliveries had weight range group of 2.5-3.5 kg. One hundred and twenty-nine deliveries occurred at 41-42 weeks of gestation. Ninety five women had vaginal deliveries while 78 had emergency LSCS. Seventy eight (38.6%) underwent emergency caesarean section. Thirteen percent had instrumentation with vacuum or forceps. APGAR score was more than 7 in 71.3% neonates at one minute and 94.6 neonates at five minutes.

Twenty three percent (N=46) babies required one or more forms of resuscitation at birth. Thirty four percent (N=68) were put on respiratory support like oxygen via head-box/ nasal prongs, bubble CPAP, or mechanical ventilation (Table 4).

One hundred and seventy-two (85.2%) babies delivered were healthy with no complications. Pneumonia was seen in 19 babies and four had septicemia. Three cases had expired (Table 5).

DISCUSSION:

This study was conducted to find out the incidence and analyze the risk factors for MSAF and MAS. The incidence of MSAF was 13.6% in our study and among those babies 14.8% developed MAS. Similar incidence has been reported in another study by Dohbit JS et al.,[5] with MSAF being reported as 11.15% out of which 2.34% was MAS. The reason for low MAS in the study could be explained by the large sample size of more than 2000 babies. Thirupathi RA et al.,[4] showed the

incidence of MAS to be 13.12% while Gurubacharya S et al.,[6] reported MSAF and MAS in 14.8% and 6.6% respectively. However Addisu D et al.,[7] reported prevalence of MSAF 17.8% among 495 mothers in Felege Hiwot Referral Hospital in North West Ethiopia which is also a low-income country like Nepal.

Table 5. Final diagnosis of babies born through MSAF their outcome.

Final Diagnosis	N	%
Healthy babies without complications	172	85.2
MAS with pneumonia	19	9.4
MAS with septicemia	4	2
Perinatal asphyxia with MAS	3	1.5
MAS with shock	2	1
MAS with meconium gastritis	1	0.5
MAS with PPHN	1	0.5
Outcomes		
Discharged	197	97.5
Expired	3	1.5
Referred	1	0.5
Left against medical advice	1	0.5

PPHN: Primary Pulmonary Hypertension.

Akhila S et al.,[8] in their study of 348 live births in India showed MSAF in 7.13% cases. Lamichane A[9] reported MSAF in 7.72% and MAS 12.20% in an 11 months study done in Western part of Nepal. This incidence is similar to ours as this institute is near to LMCTH and women might have similar risk factors as they are hailing from the same rural locality. Similarly, Mohammad N et al.,[10] reported MSAF 7.84% and MAS 12% in a study in Pakistan. The incidence of MAS was 10/1000 live births in University Hospital of West Indies, Jamaica in a retrospective study done over five years by Panton et al.[11]

Although the exact cause of MSAF is unclear; fetal distress, cord accidents and maternal hypertension have been identified as potential risk factors.[4] MSAF was seen in 21% of teenage pregnancy in our study which is higher than the national figure of 17% in NDHS 2016 but equivalent to that of rural areas (22%).[4] The study site is also located in the a rural area so higher the rate of teenage pregnancy, higher would be the rate of MSAF. Sixty three percent of our mothers were primigravidae similar to the report of Chaudhary R et al.[3] Primigravida and/ or teenage pregnancy have increased risk of prolonged labor which in turn may increase the risk of MSAF or MAS.[3] On the other hand, the rate of teenage pregnancy might also depend on education status of mothers. Antenatal visits have a role in counseling and explaining danger signs and identifying risk factors for MSAF. Seventy three percent of women with MSAF had more than four antenatal visits which is similar to the national ANC coverage data.[12]

This study aimed to identify the risk factors for MSAF. Sixty four percent of mothers with MSAF were between 41-42 weeks while the rest were between 37-40 weeks of gestation in our study. Postdated pregnancy was seen in 30% in a study by Panton et al.[11] There were no post term (>42 weeks) pregnancy in this study. This could be because women came to hospital in time and were more aware of pregnancy related complications and thus had less incidence of MSAF. Chaudhary R et al.,[3] in Jhanshi reported that 59% of mothers with MSAF were of 38-40 weeks of gestation. Post term pregnancy increased the risk of MAS. Maternal risk factors for MSAF in decreasing frequency were maternal age <25 years, post-dated pregnancy, anaemia, primipara, thick meconium, small for gestational age, PROM, intrauterine growth restriction, HDP, antepartum hemorrhage, diabetes and oligohydramnios.[3] HDP with MSAF is caused by underlying utero-placental insufficiency, which causes fetal hypoxia, resulting in passage of meconium, meconium aspiration, respiratory distress and its consequences.[2] Similar risk factors have been mentioned in studies by Chaudhary et al.,[3] Dohbit et al.,[5] Avula TR et al.[4] and Gurubacharya S et al.[6] Maternal anemia was present in 28.2% in our study which is higher than that of the study by Chaudhary R et al.,(12.05%).[3] Nepal has a high prevalence of anemia so this could be the reason for higher rate of anemia.[12]

Cesarean section (CS)was the mode of delivery in 40% cases. MSAF is the risk for neonatal morbidities so increased CS rate is justifiable. Chaudhary R et al.,[3] had 54.22% (n=45) of MAS babies born via CS which is similar to this study.

Neonatal morbidities in our study in decreasing order of frequency were MAS pneumonia followed by MAS with culture positive septicemia, asphyxia and shock. One of the babies had mild

symptoms of vomiting and feed intolerance with meconium gastritis. One had significant pre- and post-ductal SpO_2 difference and echocardiography diagnosis of PPHN. All of these signs and symptoms are the consequences of MAS. Similar morbidities like jaundice, pneumonia, birth asphyxia, and septicemia were reported in the study by Chaudhary R et al.[3] Neonatal resuscitation, neonatal asphyxia and neonatal infection were noted in the study by Dohbit J S et al.[5]. Low APGAR, low birth weight, intrauterine growth restriction, immediate resuscitation, endotracheal suctioning, nursery admission and MAS were seen in a study done in Pakistan.[10]The study by Panton L et al.[11] in West Indies, Jamaica reported morbidities like fetal distress, post dated pregnancy, emergency cesarean section, mechanical ventilation, bubble CPAP, hypoxic ischemic encephalopathy (HIE), PPHN and pneumothorax.

Sixty eight (34%) of our neonates required respiratory support in the form of oxygen via head-box/ nasal prongs, bubble CPAP and mechanical ventilation. Avula TR et al.,[4] in their study in a tertiary health facility showed 42.85% of MAS babies required ventilation support in the form of CPAP and intermittent mandatory ventilation (IMV).[4] MAS babies requiring mechanical ventilation and bubble CPAP were 6% and 15% respectively in the study by Panton L et al.[11] Bubble CPAP and IMV support were required in 6-15% in other studies done by Edmond et al.,[13] and Shaikh et al.[14]

MSAF is a threat to a neonatal life unless measures like close labour monitoring and timely interventions like emergency CS, effective neonatal resuscitation, NICU care and judicious management are given to save the life. Low APGAR scores at one and five minutes had association with thick meconium.[10] It was associated with fetal distress and mothers with HDP.

In our study, mortality rate was 1.5%, which was similar to2.34% in another studydone in two hospitals in Cameroon by Dohbit JS et al.[5] and 4.7% in the study by Edmond MN et al.[13] Mortality rates vary from minimum mortality at0.86% in a study done in Maharasthra, India by Akhila S et al.[8] to as high as11% to 24% in studies done by Chaudhary R et al.,[3] Thirupathi et al.[4] and Gurubacharya S et al.[6]This difference could be due to the difference in sample size. The study with high number of study population have high incidence rate of MSAF and high mortality rate.

This study has a few limitations. It was conducted in a small population over a short time. The incidence of MSAF and MAS in relation to educational status and economical status of the mother was not studied but it forms a basis for prevalence of MSAF and MAS in a tertiary center in Nepal.

CONCLUSION:

Meconium aspiration syndrome is a common complication of meconium stained amniotic fluid. It is a significant yet preventable cause of neonatal morbidity and mortality. Identifying risk factors may help in timely diagnosis and interventions reducing the neonatal morbidity and mortality.

Conflict of interest: Authors declare that no competing interest exists.

Funding: No funds were available for the study.

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