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Study of meconium aspiration syndrome and its clinical outcome in neonates

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Abstract
Background: *Meconium staining of amniotic fluid complicates delivery in approximately 8% to 25% of live birth and only 5% of neonates born through MSAF develop MAS . Meconium in amniotic fluid is graded as thick if the fluid is tenacious, viscous, and opaque "Pea soup" and it is graded as thin if it appears to be watery and yellowish to light greenish coloration.*
Objective:*1.Study of incidence of meconium aspiration syndrome in neonates in relation to birth weight and period of gestation.2.Study of different clinical outcomes of neonates having meconium aspiration syndrome.*
Methods:*A Prospective cohort study of inborn neonates was done from April 2016 to August 2017 admitted in neonatal intensive care unit, Department of paediatrics and Neonatology, RIMS, Ranchi after obtaining written informed consent from the parents or guardian and diagnosis of MAS was made depending on the clinical criteria and its clinical outcome was observed.*
Results:*During the study period of 1 year (April 2016 to August 2017), out of 5384 deliveries, 588(11.2%) neonates had meconium stained liquor and out of these 588 neonates, 56 (9.6%) neonates developed MAS. The total number of neonates having respiratory distress was 387. Total of 19 (33.9%) cases required ventilator support and mortality occurred in 24(42.8%) cases.*
Conclusions: *Increased incidence of meconium aspiration syndrome was associated with.*
a). Increase in the gestational age (more in term and post term neonates). b). Birth weight > 2.5kgs.
c). Cesarean delivery.
A proper diagnosis and timely intervention can reduce the morbidity and mortality in meconium aspiration syndrome.
Keywords: *Birth weight, Gestational age, Meconium Aspiration Syndrome*

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I. Introduction

Meconium-stained amniotic fluid (MSAF) occurs in approximately 10-15% of live births Meconium aspiration syndrome occurs in 5% of infants born through MSAF. Meconium staining of amniotic fluid has been considered to be a predictor of poor fetal outcome because its direct correlation to fetal distress and increased likelihood of inhalation of meconium [1] .In utero, meconium passage rarely occur before 32 weeks of gestation and most babies with meconium stained amniotic fluid are 37 weeks or older [2] .Incidence of MSAF increases thereafter, and approximately 30% of newborns have MSAF if born after 42 weeks of gestation. An increase incidence of MSAF is noted in presence of feto-maternal stress factor such as hypoxia and infection, independent of fetal maturation. The increased incidence of MSAF with advancing gestational age probably reflects the maturation of peristalsis in the fetal intestine. Motilin, an intestinal peptide that stimulates contraction of the intestinal muscle, is in lower concentrations in the intestine of premature vs. postterm infants. Umbilical cord motilin concentration is higher in infants who have passed meconium than in infants with clear amniotic fluid. Intestinal parasympathetic innervation and myelination also increase throughout gestation and may play a role in the increased incidence of passage of meconium in late gestation . In utero passage of meconium is also associated with fetal asphyxia and decreased umbilical venous blood PO2. Experimentally, intestinal ischemia produces a transient period of hyperperistalsis and relaxation of anal sphincter tone, leading to the passage of meconium. The fetal diving reflex, which shunts blood preferentially to the brain and heart and away from the visceral organs during hypoxia may enhance intestinal ischemia. The gasping respiratory efforts that accompany fetal asphyxia contribute to the actual entry of meconium into the respiratory tract, resulting in MAS[3] .

Meconium passage is a developmentally programmed post natal event because 98% of healthy newborn pass meconium in first 24 to 48 hours after birth [4].

MAS is described as development of respiratory distress soon after birth with radiological evidence of aspiration pneumonitis in the presence of meconium staining of liquour, staining of nails, staining of umbilical cord or skin [3].Passage of meconium was significantly associated with severe asphyxia and carried a bad prognosis with increased risk of development of meconium aspiration syndrome, hypoxic ischemic encephalopathy, seizures and pulmonary air leak syndrome [5] .Avoidance of post term pregnancies and improving intrapartum monitoring are beneficial in reducing the incidence of MSAF and MAS. Recent advances in management of acute lung injury such as positive end expiratory pressure, surfactant therapy, high frequency ventilation and use of inhaled nitric oxide have led to reduced incidence of adverse outcome and improved survival rate of infant with MAS [4]

II. Material And Methods

A Prospective cohort study was done of all Inborn Neonates with meconium aspiration syndrome admitted in neonatal intensive care unit,Department of pediatrics and Neonatology,RIMS,Ranchi from April 2016 to August 2017 after obtaining written informed consent from the parents or guardian.

Inclusion criteria:

All preterm,term and post term neonates with meconium aspiration syndrome (Cloherty 7thed)i.e having following features:1.History of Meconium stained amniotic fluid. 2.Tachypnea,retraction,grunting or other abnormal sign on physical examination consistent with respiratory distress, within 24 hours of life.3.Need for supplemental oxygen.4.An abnormal chest x-ray consistent with aspiration pneumonitis.

Exclusion criteria:

1.Neonates with meconium stained amniotic fluid but without any respiratory distress or chest X-ray finding not consistent with aspiration pneumonitis.2.Neonates with TTNB,HMD,congenital pneumonia,sepsis.3.Neonates who will get LAMA.4.Non availability of complete Data.

Method of evaluation:

During delivery, the type of delivery and any complications in the mother were recorded and resuscitative measures done were suctioning of the oropharynx by pediatrician after delivery of head.When required, endotracheal intubation was done and bag and tube ventilation was given.

If vigorous neonate was placed with mother and was provided routine care as per NRP guidelines.

Following Investigations were done :-

1. Complete blood count (Haemoglobin,RBC count,Total leucocyte count,Differential leucocyte count, platelets count,PCV) and peripheral blood smear
2. Band cell count,micro ESR, C-Reactive protein(CRP) and blood culture
3. Arterial blood gas(ABG) analysis.
4. Blood Urea.
5. Serum creatinine.
6. Serum calcium estimation.
7. Random Blood glucose Level estimation.
8. Chest X-ray AP view
9. Echocardiography

- For analysis of results ,the methods and test used were
  Mean ± Standard Deviation
  Percentage distribution
  2×2 tables
  Chi - Square test
  Pearson Chi – square test
  Multiple Bar Diagram

The results of analysis are depicted in Tables . Wherever applicable statistical significance was evaluated by 'p' value <0.05 . The entire Statistical analysis was done with the help of Department of Community Medicine, Rajendra Institute of Medical Sciences ,Ranchi , in Microsoft Excel using Software Graph- pad Prism ver. 6.0 and Graph-pad Instant Software.

III. Results

Association of Maternal Factors with MAS

Among 56 cases, fetal distress was found to be the most commonest (n=24,44.2%) factor associated with MAS followed by PIH (n=12, 22.05%), PROM (n=10,18.56%) and oligohydraminios (n=07, 9.44%). 03 cases (5.75%) were not associated with any factor (Table 1)

Modes of Delivery in different group of neonates having MAS

Out of 56 neonates, those born by cesarean formed the highest percentage (n=39, 71.2%) of cases followed by neonates born by normal vaginal delivery (n=09, 16.07%). Neonates born by Assisted delivery were (n=8, 12.73%).(Table 1)

Distribution of MAS with gestational age .

Out of 56 neonates, majority of the cases of MAS occur in term neonates with mean gestational age of 38-40 weeks. 27 (48.2%) neonates belong to 38-40 weeks of gestation and 17(30.3%) neonates were of 40-42 weeks of gestation. 3 (5.3%) cases is reported in neonates > 42 weeks of gestation. MAS was also seen in preterm neonates. 3 (5.3%) cases were of 34-36 weeks of gestation and 6 (10.7%) belonged to 36-38 weeks of gestation. None of the cases were below 34 weeks of gestation.(Table 1)

Distribution of MAS in different birth weight .

The mean birth weight of neonates with MAS was 2.72 ±0.413491 kg .The maximum number of cases of MAS were seen in neonates with Normal birth weight between 2.5-2.9kgs (n=33, 58.9%), 3.0-3.4 kg (n=11, 19.6%) and 3.5-3.9 (n=2, 3.57%), Neonates with Low birth weight between 2.0-2.4 kg had 7(12.5%) and 1.5-1.9 had 2(3.57%) cases,There was no cases of MAS in very Low birth weight (VLBW) and Extremely Low birth weight (ELBW) neonates (Table 1)

Sex distribution in MAS.

Out of 56 neonates, sex distribution was almost equal with male distribution of 53.57% cases and females with 46.4% cases.(Table 1)

Different complications associated with MAS.

Out of 56 neonates, the most common complication was birth asphyxia in (60.7%, n=34) of cases, followed by septicemia in (n=18, 32.1%) cases. ARF (Acute Respiratory Failure) was seen in 25% (n=14) cases, Pneumonia was seen in 17.8% (n=10), pneumothorax in 3.5% (n=2) of cases. Some neonates had more than one of the above mentioned complications. 13 neonates (23.2%) had complication like Intraventricular hemorrhage, Primary Pulmonary Hypertension, Congenital Heart Disease, Pulmonary Hemorrhage other than those mentioned above. (Table 1)

Distribution of different Modes of Treatment given in MAS .

All neonates were provided appropriate respiratory support .(Fig 8) Out of 56 neonates, oxygen, fluids , antibiotics, Vitamin K, calcium were given to 26 (46.4%) cases and 11 cases (19.6%) needed additional CPAP, Whereas ventilatory support (Fig 7) was given in birth asphyxia, acute respiratory failure or other complications like pneumothorax in 19 (33.9%). Out of 19 ventilated neonates, 17 neonates died and 2 baby survived and was discharged. (Table 1)

Clinical outcome of neonates with MAS

Out of 56 neonates of meconium aspiration syndrome, total 32 (57.1%) neonates recovered and 24 neonates had mortality(42.8%) (Table 1)

Distribution of factors associated with mortality in MAS.

The most common cause of mortality was birth asphyxia constituting (n=12, 50%) of cases followed by its association with ARF and septicemia (n=8, 33.3%) , Isolated ARF ,ARF with pneumothorax and ARF with pulmonary hemorrhage with sepsis constituted 8% (n=2) .(Table 1)

Maternal causes		
MaternalData	**Total No.ofCases**	**% of total cases**
Fetaldistress	24	44.2
PIH	12	22.05
PROM	10	18.56
Oligohydramnios	07	9.44
Others	03	5.75
ModeofDelivery		
Cesarean Section	39	71.2
Normaldelivery	09	16.07
Assisteddelivery	08	12.73
GestationalAge(Weeks)		
<34	0	0
34–36	3	5.3
36–38	6	10.7
38–40	27	48.2
40–42	17	30.3
>42	3	5.3
BirthWeight (inKgs)		
1.5–1.9	2	3.57
2–2.4	7	12.5
2.5–2.9	33	58.9
3–3.4	11	19.6
3.5–3.9	2	3.57
>4	1	1.78
Meconium type		
Thin	26	46.4
Thick	30	53.7
Sex Distribution		
Male	30	53.57
Female	26	46.4
Complications		
BA(Birth Asphyxia)	34	60.7
ARF(Acute Respiratory Failure)	14	25
Pneumonia	10	17.8

Septicemia	18	32.1
Pneumothorax	2	3.5
Others	13	23.2
Treatment given		
Oxygen treatment	26	46.4
Oxygen + CPAP	11	19.6
Oxygen + CPAP +Ventilatorsupport	19	33.9
Neonatal Outcome		
Mortality	24	42.8
Recovery	32	57.1
Death due to complication		
IsolatedBirthAsphyxia	12*	50
IsolatedARF	2	8
ARFwithpneumothorax	2	8
ARFwithpulmonaryhaemorrhagewithsepticemia	2	8
BirthAsphyxiawithARFwithsepticemia	8	33

Table 1 -* 1 case is associated with IUGR

APGAR distribution in MAS.

Out of 5 6 neonates of MAS at admission 18 cases (32.14%) had APGAR score 0-3 , and 35 cases (62.5%) had a score of 4-6. ; and 3 (5.3%) cases has score between 7-10. After 5 minutes of resuscitation among neonates with APGAR score 0-6 some neonates showed improvement in APGAR with 23 (41.07%) neonates remained with APGAR OF 0-6 and 33(58.9%) neonates were having APGAR between 7-10.(Table 2)

	APGAR SCORE	**Total No. of cases (%)**
1 minute	0-6	53(94.6%)
	7-10	3 (5.35%)
5 minute	0-6	23(41.07%)
	7-10	33 (58.9%)

Table 2: showing Assessment of APGAR of neonates at 1 and 5 minutes

Assessment of severity of respiratory distress(Downe's score) in MAS .

The present study showed that initial Downe's score recorded among neonates was as follows: 5 cases (8.9%) with Downe's score 0-3 , and 24 cases (42.8%) had a score of 4-6; and 27 (48.2%) cases had score > 6 .The final Downe's score was as follows: In 32 cases 57.1% had Downe's score between 0-3 and 24 cases(42.8%) had Downe's score of 4-6.which shows improvement in Downe's score after appropriate treatment (Table 3)

DOWNE'S SCORE	**Total No. of cases (%)(Final Outcome)**	**Total No. of cases(%)(Initial Outcome)**
0-3	32(57.1)	5(8.9)
4-6	24(42.8)	24(42.8)
7-10		27(48.2)

Table -3 : Assessment of severity of respiratory distress(Downe's score) in MAS .

IV. Discussion

Incidence of MAS

Out of 2344 neonates admitted, 588 neonates which was 11.2% of the total delivery were meconium stained of which 56 cases (9.6%) were diagnosed to have MAS.

Narang et al[5] 1993 found Meconium Stained Amniotic Fluid (MSAF) was found amongst 7.4% of all deliveries and among these 10.5% neonates developed meconium aspiration syndrome (MAS) . In a study by Vineeta Gupta, B.D. Bhatia and O.P. Mishra[6] (1996), Varanasi incidence of MSAF was 14.3% of all the deliveries.In a study by Bharati Rao et al[7] 2011, the incidence of meconium staining of amniotic fluid was observed to be 8.54% of which MAS was found in 16.1% of cases.In a study done by wiswell, Tuggle and Turner[8] in 1990, 5.41% of MSAF neonates to as low as 2.28% of MSAF done in a study by Fisher and coworkers[9] in 2012.S imilarly Yoder et al[79] 2002 found nearly four fold decrease of incidence of MAS from 1990 to 1998.As compared to developing world, developed countries has significantly reduced the incidence of MAS.

STUDY	MAS (%) AMONG ALL DELIVERIES
Wiswell et al 1990	5.41
Narang et al 1993	7.4
BhartiRao et al 2011	16.1
Fischer et al 2012	2.28
Present Study	11.2

Table 4 : Different studies showing incidence of MAS

Maternal Factors association with MAS

Among 56 cases, fetal distress was found to be the most commonest (n=24,44.2%) factor associated with MAS followed by PIH (n=12, 22.05%), PROM (n=10,18.56%) and oligohydraminios (n=07, 9.44%). 03 cases (5.75%) were not associated with any factor (Table 1) Thus Meconium staining of amniotic fluid and subsequently leading on to MAS was more commonly seen with associated maternal condition like fetal distress (44.2%) due to various causes, Pregnancy induced hypertension, chorioamnionitis, oligohydramnios and post term pregnancies. Incidence of these factors in the present study has been compared with those of other authors.The cause of fetal distress and neonatal respiratory distress in association with MSAF is not always clear. A prospective study was undertaken by Cougherty H et al[10] in 1993 concluded that fetal distress is common in infants who develop respiratory distress after MSAF. The present study PIH was found in 22.05% which was in accordance to 23.58% cases in a study by Miller et al[11] (1975), and in 15.75% cases in a study by Pravin and Usha Krishna [12](1989) and in 11.20% by Klionsky [13](1975). Incidence of PROM was found in 6.60% cases by Miller et al [11] in 1975, 3.10% cases in a study by Meis et al[14] (1978). Among other maternal complication Maternal Hepatitis was most common 2(3.5%) which was supported in another study by Vineeta Gupta, B.D. Bhatia and O.P. Mishra[6](1996) in BHU showed of the various antenatal complications studied, where only hepatitis was significantly associated with MSAF.In another study by Hofmeyer GJ et al[15] (2014) it was found that the presence of oligohydramnios is a cause of thick meconium staining of the amniotic fluid. In the present study only 9.44% cases were associated with oligohydraminos. similar study by jeng, Lee and associates[16] in 1992 showed the higher incidences of meconium staining, cesarean delivery for fetal distress, abnormal fetal heart rate monitoring in maternal oligohydramnios.

Modes of delivery and MAS

In the present study of MAS, neonates born by LSCS formed the highest percentage (n=39, 71.2%) followed by neonates born by normal vaginal delivery (n=09, 16.07%) and by assisted delivery (n=8, 12.73%). (Table 1) These figures are almost in correlation with figures of other authors. Naranget al[5] 1993, found 54.2% neonates were born by LSCS and 30.7% were delivered by normal vaginal delivery and 11.8% by forceps delivery. In a study by zahid et al[17]2011 showed similar results with 73% be cesarean section and 20.1% Normal Vaginal Delivery and 6.4% Assisted delivery.In developed world study by fischer et al[9] 2012,showed majority of delivery of neonates with MAS by vaginal route (44.9%), which was followed by cesarean section(37.2%) and assisted delivery (17.9%). There was also higher incidence of cesarean section (77%),vaginal (13.3%) and assisted delivery (19.2%) associated with neonates with thin meconium as compared to thick meconium group. However the results are not statistically significant.(P value - 0.838).

STUDY	LSCS	NVD	AD
Narang et al 1993	54.2	30.7	11.8
Zahid et al 2011	73.3	20.1	6.4
Fischer et al 2012	37	44.9	17.9
Present Study	71.2	17.07	12.73

Table 5 : Different studies showing modes of delivery used in MAS

MAS and gestational age

Majority of the cases of MAS occur in term neonates with mean gestational age of 38-40 weeks. 27 (48.2%) neonates belong to 38-40 weeks of gestation and 17(30.3%) neonates were of 40-42 weeks of gestation. 3 (5.3%) cases were reported in neonates > 42 weeks of gestation. MAS was also seen in preterm neonates. 3 (5.3%) cases were of 34-36 weeks of gestation and 6 (10.7%) belonged to 36-38 weeks of gestation. None of the cases were below 34 weeks of gestation.(Table 1).Which was Similar to results found in a study by Tariq et al[18] in 1996 in lahore where majority of cases admitted with MAS was term i.e of age group 37 weeeks and satish et al[19] in 2014 at sangli, Maharashtra where 59% neonates were between 38 weeks - 40 weeks.Study of developed world by zhang et al[20] in 2009 in USA and Burgundy by Fischer et al[9] in 2012 were similar the incidence of MAS , which was stable from 37 to 39 Week of Gestation and increases afterwards particularly in infants born at 42-43Week of Gestation the risk of MAS is approximately 4-fold and 27-fold at 42 week of gestation and 43 Week of Gestation in comparison to 37Week of Gestation.

In National Neonatal Perinatal Database of India 2002- 2003, the mean gestational age of neonates born through MSAF was 39 weeks.

STUDY	<36 WEEKS(%)	36-38 WEEKS(%)	38-40 WEEKS(%)	40-42 WEEKS(%)	>42 WEEKS(%)
Tariq et al 1996	2.2	84		13.6	
Dargaville et al 2001				34	
Satish et al 2014	3.8	5.7	51.9	32.6	5.7
Present study	5.3	10.7	48.2	30.3	5.3

Table 6 : Different studies showing % of neonates with MAS in different gestational age

MAS and Birth Weight

The mean birth weight of neonates with MAS was 2.72 ± 0.413491 kg .The maximum number of cases of MAS were seen in neonates with Normal birth weight between 2.5-2.9kgs (n=33, 58.9%), 3.0-3.4 kg (n=11, 19.6%) and 3.5-3.9 (n=2, 3.57%), Neonates with Low birth weight between 2.0-2.4 kg had 7(12.5%) and 1.5-1.9 had 2(3.57%) cases, There were no cases of MAS in very Low birth weight (VLBW) and Extremely Low birth weight (ELBW) neonates.(Table 1).Similar outcome in study by satish et al[19] in 2014 with maximum case were between birth weight 2.5-3.5 Kg . and tariq et al[18] in 1996 with mean birth weigh 3018± 650 gms. According to study by Pravin Goud et al[12]1989 majority of neonates in their study weighed 2.5kg – 3kg and 4.2% of neonates weighed >3.5kgs.

In National Neonatal Perinatal Database of India 2002-2003, the mean birth weight of neonates born through MSAF was 2646 ± 552 gm.In a study by Bharati Rao et al[7] in 2011, the birth weight of neonates with MSAF were in the range of 1600-3800 gms, with mean birth weight of 2.516 gm.

STUDY	LBW %(<2500gms)	NBW %(2500-4000gms)
Tariq et al ,1996	13.6	84
BhartiRao et al,2011	33	67
Fischer et al,2012	19.1	80.9
Satish et al,2014	3.21	84.1
Present study	16.07	85.7

Table 7: Different studies showing distribution of neonates with MAS in differentBirth weight

MAS and APGAR score at 1 minute and 5 minute

Out of 56 neonates of MAS at admission 18 cases (32.14%) has APGAR score 0-3 , and 35 cases (62.5%) had a score of 4-6. ; and 3 (5.3%) cases has score between 7-10 . At 5 minutes of resuscitation among neonates with APGAR score 0-6 some neonates showed improvement in APGAR with 23 (41.07%) neonates remained with APGAR OF 0-6 and 33(58.9%) neonates were having APGAR between 7-10.(Table 2).In a similar study by satish et al[53] 2014, APGAR Score at 1 minute was >7 (7.6%), 4-6 (61.5%) and < 3 (30.7%), which was also comparable with Gregory et al 1974. They found > 7 (4.5%), 4-7 (49%) and < 3 (36.5%). It shows an important relation between APGAR Score and MAS neonates.Thus neonates with MAS have highest incidence between APGAR score of 4-6.

The initially low Apgar scores has been universally associated with MAS (Dargaville et al[23] 2001) might be resulted from direct vasoconstrictor effect of meconium on the umbilical vein, leading to vasospasm and, consequently, impaired placental blood flow (Alshuler et al[24], 1992).Fischer et al[9] 2012 also found APGAR of <3 at 1 min was 51.7% which gradually improved with treatment to APGAR of <5 at 5 min to be 32.5% with a

P value of 0.0001. Similar conclusions was done by jeng Lee et al[27] of Apgar scores of < or = 7 or less at one minute.

Assessment of respiratory distress in MAS

The present study showed that initial Downe's score recorded among neonates was as follows: 5 cases (8.9%) with Downe's score 0-3, and 24 cases (42.8%) had a score of 4-6; and 27 (48.2%) cases had score > 6. The final Downe's score was as follows: In 32 cases 57.1% had Downe's score between 0-3 and 24 cases(42.8%) had Downe's score of 4-6 which shows improvement in Downe's score after appropriate treatment (Table 3).However a cohort study conducted done by Yeung C et al[25] in Hong Kong between 1996 and 1999, it was found that there was no evidence of difference in incidence of fetal distress between all MSL and clear liquour upto 38 weeks of gestation but there is a strong evidence that babies with MSL were more likely to experience fetal distress compared to babies with clear liquor after 38 weeks of gestation.

Complications in MAS:

In the present study (Table 1) shows birth asphyxia (n=33, 58.9.3%) is found to be most common complication followed by acute respiratory failure (n=17,30.3%) , which was followed by Pneumonia (n=17, 30.3%), then septicemia (n=13, 23.2%) , followed by pneumothorax (n=4,7.14%) which is in accordance with study by Wiswell TE et al[74] in 1990,where it was found that 11.53% neonates develop pneumothorax.

In National Neonatal Perinatal Database of India 2002-2003, perinatal asphyxia was single most common cause of death (40.5 %) in neonates born through MSAF with overall mortality of 11.6%.Other complications like Intraventricular hemorrhage, Necrotising enterocolitis, pulmonary haemorrhage, pulmonary interstitial emphysema, and pneumomediatinum have also been noted in present study.Pneumothorax occurs in around 10.5% of all ventilated infants with MAS , and the presence of this complication potentiates lung atelectasis and PPHN and increases the risk of mortality.Narang et al[5] in 1993 studied Passage meconium was significantly associated with severe asphyxia and carried a bad prognosis with increased risk of development of meconium aspiration syndrome, hypoxic schemic encephalopathy, seizures and pulmonary air leak syndrome.

Mode of treatment and MAS:

All neonates were provided appropriate respiratory support. Out of 56 neonates, oxygen, fluids , antibiotics, Vitamin K, calcium was given to 26 (46.4%) cases and 11 cases (19.6%) needed additional CPAP, Whereas ventilatory support was given in birth asphyxia, acute respiratory failure or other complications like pneumothorax in 19 (33.9%). Out of 19 ventilated neonates, 17 neonates died and 2 baby survived and was discharged. (Table 1). Thus two third of patient were manage with oxygen and CPAP and one third were ventilated.In a study by Wiswell TE et al[8] 1990 it was found that of the neonates with MAS, 29.7 % required mechanical ventilation which was similar in frequency to our study.In this study Satish et al[19] 1993, 76.9% were treated conservatively, 23.07% were ventilated which was also comparable to our study. Fischer et al[9] 2012 had similar treatment modalities with oxygen alone in 152 (63.1%), nasal CPAP without mechanical ventilation in 3 (1.2%), conventional ventilation without high frequency oscillation (HFO) in 69 (28.6%), The ventilation of neonates with meconium aspiration syndrome is not easy even in the best of centres but we need to improve our practices. It is highlighted by the inappropriately high mortality for the neonates who were ventilated after the 1st hour of life as well as the higher number of pneumothoraces.Goldsmith[26] (2008) highlighted that the optimum modes of ventilation for MAS are not known. He pointed out that high-frequency ventilation, inhaled nitric oxide, surfactant and extracorporeal membrane oxygenation are rarely required.Kamala swaram et al[4] 2012 came to the conclusion that as MAS is a major cause of mortality in developing countries, studies focusing on prevention and early treatment should be continued to reduce mortality and morbidity.

Clinical outcome in MAS:

Out of 56 neonates of meconium aspiration syndrome, 32 (57.1%) neonates survived and 24 (42.8%) neonates died (Table 1)Isolated birth asphyxia was the main cause of death in 54.1% cases. Followed by Acute Respiratory failure (ARF) with birth asphyxia and septicemia in 20.8% of cases followed by ARF with Pulmonary Haemorrhage with septicemia in 16.6% cases, isolated Acute Respiratory failure (ARF) in 8.3% and ARF with pneumothorax in 4.1% of cases (Table 1). The outcome was almost similar in a study in Pakistan by Zahid et al[17] in 2011 with overall mortality being 32%.The distribution of cause of mortality was similar with Birth asphyxia being commonest 68%.the total death due to pneumothorax was 10.9 which was similar to outcome in this study.This mortality is higher when compared to study by Fischer et al[9] in 2012 which was 7.9% but the most common cause of mortality remains the same that was due to Birth Asphyxia, Similar results shown in a study by Narang et al[5] in 1993 and satish et al[19] in 2014 showing less incidence of mortality of 7.7% and 15.3%.The overall cause of mortality in study by Satish et al[19] 2012 was same in distribution as our study

with Birth asphyxia being the commonest (37.5%) followed by sepsis (25%) and pneumonia (12.5%).Narang et al[5] 1993, also found that 53.8% cases of MAS had birth asphyxia and 15.8% had air leak and 3.8% had PPHN. Wiswell TE et al[8] 1990 found that majority of neonates with MAS died from acute respiratory failure, PPHN and air leaks but some will die from associated neurological or renal sequelae of birth asphyxia.In different studies the assessment of mortality figures may vary widely, Davis et al[27] 1985 reported 12 deaths in 30 infants i.e. 40% moratlity rate.

STUDY	MORTALITY(%)	RECOVERY(%)
Narang et al 1993	7.7	92.3
Zahid et al 2011	32	68
Fischer et al 2012	7.9	92.1
Satish et al 2014	15.3	84.7
Present study	42.8	57.1

Table 8: Clinical outcome in MAS

V. Conclusions

MAS refers to presence of meconium below the vocal cords and in the lungs.

Meconium aspiration syndrome (MAS) is one of the common causes of respiratory distress in the newborn.

1. During the study period of 1 year (April 2016 to August 2017), out of 5384 deliveries, 588(11.2%) neonates had meconium stained liquor and out of these 588 neonates 56 (9.6%) neonates developed MAS.
2. Increased incidence of meconium aspiration syndrome was associated with.

a. Increase in the gestational age (more in term and post term neonates).
b. Birth weight > 2.5kgs.
c. Cesarean delivery.

MAS carries a high morbidity and mortality. Maximum mortality was associated with thin meconium and low APGAR score at 1 minute. In our study, mortality occurred only in 24 cases (42.8%).

Hence proper diagnosis and timely intervention can reduce the morbidity and mortality in meconium aspiration syndrome. A similar study on a larger sample size will give a definite correlation of various factors associated with MAS and its outcome .

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