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"A Study On Clinical Profile Of Meconium Aspiration Syndrome In Relation To Gestational Age, Birth Weight, Their Immediate Outcome In Neonates Admitted In Kgh, Visakhapatnam." Short title – Clinical outcome of meconium aspiration syndrome.

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ABSTRACT :
Background: This study's aim and the objective was to know the factors leading to Meconium Aspiration Syndrome in relation to gestational age, birth weight, and their immediate outcome. **Methods:** This study was done on neonates admitted in NICU, K.G.H., Visakhapatnam, who fulfilled the criteria of MAS. Babies born of meconium-stained liquor are resuscitated as per 2020
N.R.P. guidelines. The complications and the immediate outcome was observed in admitted babies. **Results:** Meconium Aspiration Syndrome is most commonly seen in term and post-term neonates with a mean birth weight of 2.821 +/- 0.5182 kilograms. The most common risk factor associated to be pregnancy-induced hypertension. The most common complication leading to death is Birth asphyxia(37.5%). The overall mortality is 12.9%.
Conclusions: MAS is most commonly associated with caesarean section, primipara, thick meconium-stained liquor, non-vigorous, fetal distress, maternal PIH, poor APGAR and high Downe's score at presentation. A significant association is seen with term and post-term & birth weight >2.5 kgs. Therefore pre and intrapartum monitoring, early induction in post-term pregnancies, appropriate intervention in non-vigorous babies to prevent possible complications and mortality.
Keywords: Birth weight, birth asphyxia, gestational age, immediate outcome, meconium aspiration syndrome.

I. INTRODUCTION:

Meconium Aspiration Syndrome continues as one of the most common causes of neonatal Respiratory distress. The overall frequency of MSAF varies between 5% to 25%, with a median of 14%[1]. Meconium Aspiration Syndrome occurs in 5 -10% of infants born through MSAF, with a higher incidence of 11 – 28% in developing countries [2]. Infants born through MSAF are 100 times more likely to develop Respiratory distress compared to counterparts born through clear amniotic fluid [1] . Meconium staining of amniotic fluid has been presumed to be a predictor of the poor outcome because of its direct relation to fetal distress and increased probability of inhalation of meconium with resultant deleterious effect on neonatal lungs [3].

Meconium stained amniotic fluid exists in 9% to 22% of live births, increasing frequency with advancing gestational age. In utero, meconium passage rarely occurs < 32 weeks of gestation, and most babies with meconium-stained amniotic fluid are 37 weeks or older [2]. The incidence of MSAF increases with gestational age, reaching as high as 30% in post-term pregnancy. An increased incidence of MSAF is noted in the presence of fetomaternal stress factors, i.e. hypoxia and infection, independent of fetal maturation [1].

Most of the full-term fetuses do not pass meconium for various reasons. In the most distal end of the G.I. tract, a "meconium cap" is formed, which is more viscous; moreover, the apparent gut peristalsis is unusual in the fetus, and the tone of the anal sphincter is greater than the tone at postterm. Factors like fetal distress due to hypoxemia, asphyxia, vagal stimulation due to cord compression stimulate gut peristalsis and relaxation of anal sphincter leading to the passage of meconium. In addition, the passage of meconium may be physiological due to increasing levels of "motilin"(intestinal hormone) as gestation advances. It is unusual for the foetuses to pass meconium <36 weeks of gestation [2]. Meconium passage is a developmentally programmed

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postnatal event because 98% of healthy newborns pass meconium 1-2 days after birth [5].

MAS remains a challenging condition confronting neonatologists. Avoidance of post-term pregnancies and improving pre and intrapartum monitoring are advantageous. Recent progress in understanding and managing acute lung injury, such as appropriate use of positive end expiration pressure, Surfactant therapy, high-frequency ventilation, and inhaled Nitric Oxide, has led to decreased incidence of adverse outcomes and improved survival rate in infants with MAS. [4]. MAS is a life-threatening condition, but not all babies born through MSAF develop MAS. Awareness of the risk factors for the development of MAS can be valuable in selecting mothers whose newborns are at increased risk and may benefit from close observation pre and intrapartum. Neonates at high risk for developing MAS can also be given added neonatal care.

II. MATERIALS & METHODS:

- **Study design**: It was a hospital-based cross-sectional study.
- **Study population**: Neonates with a history of meconium-stained amniotic fluid and meconium aspiration, admitted at NICU, King George Hospital, Visakhapatnam
- **Duration of the study**:1st January 2020 to 31st December 2020
- **Place of the study**: NICU King George Hospital, Visakhapatnam
- **Sample Size:** 62

The babies born with meconium-stained liquor should be noticed for whether the baby is vigorous or non-vigorous. Necessary resuscitation is done in non-vigorous babies. As per 2020 neonatal resuscitation guidelines, emphasis should be placed on appropriate interventions to support ventilation and Oxygenation as needed, which may include intubation. The babies with MAS admitted to NICU were observed for their immediate outcome in the hospital. After putting up with the informed written consent from the parent or guardian, the relevant information from the history, physical examination and investigation findings were recorded in a predesigned proforma. Maternal aspects including age, parity, gestational age, significant antenatal conditions and mode of delivery are recorded. The assessment was done based on APGAR scores to determine the need for any resuscitative efforts. The baby was weighed, and the gestation was assessed using Newballards score. Respiratory distress is assessed using Downe's score. A screening examination for the presence of major congenital anomalies was performed. Fetal complications like birth asphyxia, septicemia, PPHN, acute respiratory failure, pneumothorax, pulmonary haemorrhage, shock are noted, and the outcome is documented.

STATISTICAL ANALYSIS: Data was recorded on M.S. Excel sheet; descriptive analysis was carried out by mean & standard deviation for quantitative variables, number & proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagrams& pie diagrams.

INCLUSION CRITERIA: Babies with Meconium Stained Amniotic Fluid with tachypnea, retractions, grunt and other abnormal signs on physical examination showing pulmonary disease; meconium staining of nails, skin & umbilical cord with respiratory distress; babies showing features of meconium in the upper respiratory tract on examination or on chest x-ray with aspiration pneumonitis. Babies who required supplemental O_2 and ventilatory support, babies with MSAF and cephalic presentation, were willing to give consent.

EXCLUSION CRITERIA: Babies other than cephalic presentation/ congenital anomalies/ visceral or multiorgan dysfunction/clear liquor after spontaneous or artificial rupture of membranes/Who are not willing to give consent.

III. RESULTS:

Total deliveries during the study period is 1102. Of total admissions of 580, MSAF incidence is 145 (13%). The incidence of MAS among MSAF is 290 (21.01%). The incidence of MAS among all deliveries is 5.62%. The common cause of respiratory distress is hyaline membrane disease, followed by MAS.There is no sex predilection.In the taken sample of 62,40.3% (n=25) are in the range of 2.5- 2.9 kgs.The mean weight observed is 2.821+/-0.5182kgs with a minimum of 1.9kgs and a maximum of 4.1kgs. MAS is associated with caesarean section 64.5% indicating fetal distress, and primipara 66.1%. MAS is mostly seen in term (56.5%) and post-term(24.2%) deliveries.

The most common maternal risk factor is seen to be Pregnancy-induced hypertension 32.3%. No risk factors are observed in 30.6%, followed by PROM 20.9%. The immediate outcome in MAS is seen to be 87.1% discharges and a mortality of 12.9%, with 64.5% managed conservatively and 35.5% required mechanical ventilator support. The most common radiographic finding is infiltration

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and streaking, followed by hyperinflation, pneumothorax, consolidation and collapse.

Low APGAR values 24.2%, thick meconium 56.5%, high Downe's score, early onset of respiratory distress ~birth, non-vigorous babies at birth (71%) had a poor outcome.

Complications: The most common complication observed is birth asphyxia 29%, followed by Septicemia 21%, Pneumothorax 12.9%, Acute respiratory failure 9.7%, shock 8.1%, pulmonary haemorrhage, PPHN and Pneumonia with 6.5% each.

Outcome of complications: Chemical pneumonitis, PPHN, Pneumonia showing excellent outcomes. Sepsis, shock, pneumothorax, birth asphyxia and acute respiratory failure with moderate results and pulmonary haemorrhage being the worst outcome.

Birth asphyxia- 72.2% discharged
Septicemia -84.61%
Pneumothorax – 75%
Acute respiratory failure -66.66%
Shock – 80%
Chemical pneumonitis – 100%
PPHN – 100%
Pneumonia – 100%
Pulmonary haemorrhage – 0%

IV. DISCUSSION:

The incidence of meconium aspiration syndrome is 5.63%, similar to Nadia

Mohammed et al. 2018 [6], 7.85%. As per Fischer et al. 2012 [7] and Clara Ward et al. 2022 [8] are 2.28% and 3%, respectively, indicating that the incidence of MAS is more prevalent in the developing world than in developed countries. With increasing pre and intrapartum monitoring and necessary interventions, the incidence of MAS can be decreased.

In understanding the risk elements of meconium-stained liquor, it is categorisedinto two a.) Neonatal and b.) Maternal. Of these two, neonatal factors outweigh the maternal risk factors of which fetal distress (due to placental insufficiency, hypoxia, asphyxia) is the most common cause. Considering the maternal risk factors, PIH is the most common risk factor 32.25%; there were no comorbidities in 30 % of the cases. In different studies like Hanoudi et al. 2014[11] and MB Ali et al. 2019[12], post-dated pregnancy is the most seen maternal risk factor. In some other studies, PROM and Oligohydramnios are documented, whereas viral hepatitis is observed in Vineeta Gupta et al. 1996 in B.H.U.

The association of MAS is more with caesarean section (64.5%). Comparable results were observed in Zahid et al. 2011[13] (73.3%). In a study conducted by Sushanth Kumar, the frequency of caesarean section is 71.2 % among MAS. Fischer et al. 2012 [7] stated that MAS is more common in normal vaginal delivery 44.9%, MB Ali et al. 2019 [12] documented that MAS is more in normal vaginal delivery 54.78%. These observations may be due to more number of post-term deliveries. The present study observation is that MAS is more common in Caesarean section indicating fetal distress.

Mas is mostly seen in term and post-term deliveries (93.56%). Dargaville et al. 2001 [14] stated that MAS is more common in 40-42 weeks (34%). Satish et al. 2014 [15] documented that the occurrence of MAS is 95.9% in term and post-term babies.

In various recent and past studies, MAS is mostly associated with birth weight >2.5 kgs; the mean weight observed in the present study is 2.821 kgs. In the present study, it is seen that the number of cases with low 1 minute APGAR is decreased at 5 minute APGAR score with timely intervention. Similar results were observed in babies with respiratory distress; Downe's score is reduced with necessary and rational management.

Severe MAS is associated with thick meconium (56.5%).Similar results were observed with
Hanoudiet.al 2014 [11] (74%), Nadia Mohammad et.al 2018 [6] (76.5%), Rupa Vani et.al 2018[16] (71%). In Khazardoost et al. 2007 [17], the association of MAS is more commonly seen with thin meconium 89.4%. They stated that thin meconium liquor is more associated with MAS because thin meconium flows easily, reaching small airways making it amenable for suction.

The most common complication is Birth asphyxia 29%, in various other studies like Narang et al. 1993 [18] and Ashtekar et al. 2014 [9] also asphyxia remains the major complication. Pneumothorax is the major complication in Hanoudiet.al 2014 [11].

The present study's mortality is 12.9%, with 87.09% discharges. The outcome is similar to Satish et al. 2014 [15](15.3%). The mortality percentage is less than 32% of Zahid et al. 2011[13]and 23.1% of Hanoudi et al. 2014 [11]. The mortality is less than Narang et al. 1993[17] and Fischer et al. 2012[7]. The mortality is less in developed countries compared to developing countries. We can curtail the mortality and

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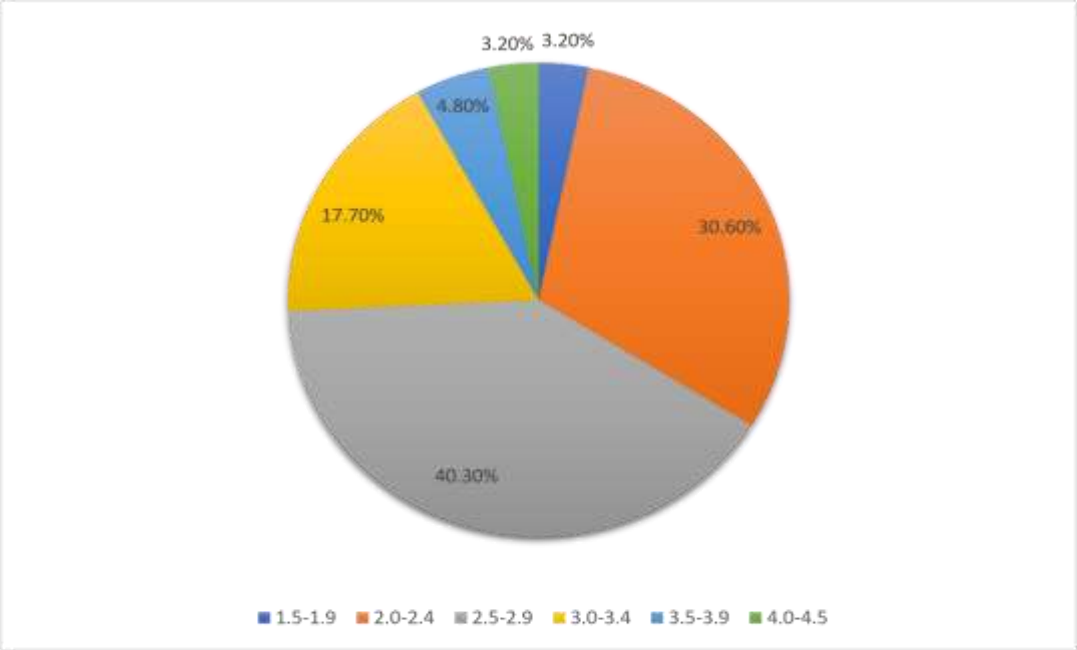
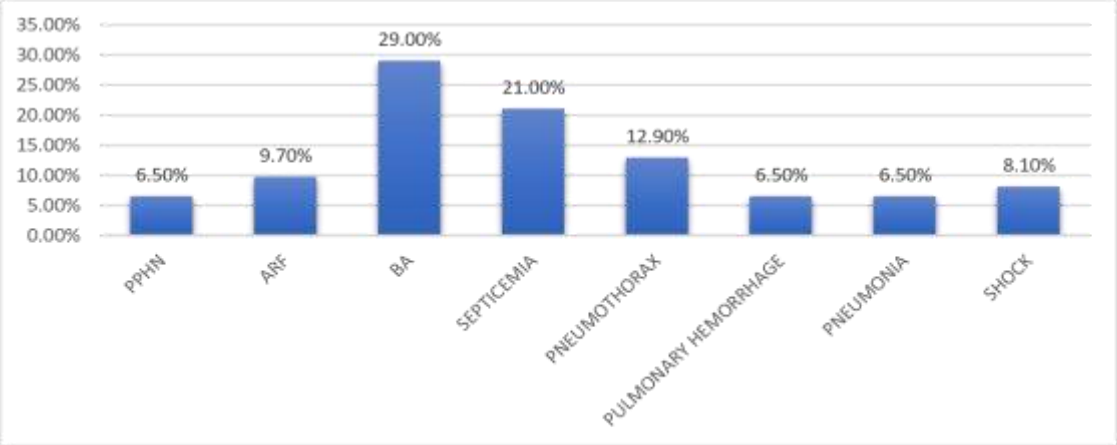
morbidity attributed to Meconium Aspiration Syndrome with timely and early treatment.

Table showing the distribution of gestational age in meconium aspiration syndrome:

GESTATIONAL AGE	Frequency	Percent
<34	1	1.6
34-35+6	3	4.8
36-37+6	8	12.9
38-39+6	35	56.5
40-42	12	19.4
>42	3	4.8

Pie diagram showing % of newborns with M.A.S. in each weight range:





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Bar graph depicting the immediate complications in M.A.S.:

Table showing association factors with M.A.S.:

Association factor	Number(out of 62)	Percent
Caesarean section	40	64.5
Primipara	41	66.1
Gestational age 38-40 wks	35	56.5
Birth weight (2.5-2.9)	25	40.3
Thick meconium	35	56.5
At birth, respiratory distress	39	62.9
Non-vigorous	34	71
Fetal distress	50	80.6
PIH	20	32.3
CXR- information &streaking	32	51.6
Discharge	54	87.1
Conservative management	40	64.5

Table showing complication percent, its outcome, p-value and Chi-Square value:

Complication	Outcome		P-value	Chisquare value
	Death	Discharge		
Thick (35)	6	29	0.257	1.285

Low Apgar (15)	**3**	**12**	**0.446**	**1.614**
Respiratory distress at birth (39)	**6**	**33**	**0.805**	**1.624**
PPHN (4)	**0**	**4**	**0.426**	**0.633**
ARF (6)	**2**	**4**	**0.116**	**2.467**
Birth asphyxia(18)	**5**	**13**	**0.025**	**4.993**
Sepsis (13)	**2**	**11**	**0.764**	**0.090**
Pneumothorax (8)	**2**	**6**	**0.274**	**1.196**
Pulmonary haemorrhage (4)	**4**	**0**	**0.001**	**28.862**
Pneumonia (4)	**0**	**4**	**0.426**	**0.633**
Shock (5)	**1**	**4**	**0.622**	**0.244**
Chemical pneumonitis (5)	**0**	**5**	**0.369**	**0.806**
Mechanical ventilation (22)	**8**	**14**	**0.001**	**16.700**

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