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# Study on Risk Factors for Assisted Ventilation in Meconium Stained Amniotic Fluid

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**Abstract**

**Background:** Meconium aspiration syndrome (MAS) is a disease of term and near-term babies associated with considerable respiratory morbidity and mortality. The clinical presentation reflects peripartum aspiration of meconium, occurring usually around the time of delivery or in utero, in association with fetal compromise that can predispose to the development of persistent pulmonary hypertension of the newborn. Aims & Objectives: To study the risk factors for assisted ventilation in meconium stained amniotic fluid. **Methods:** This was a prospective observational study done for a period of 12 months on all mothers with meconium stained liquor admitted in BebeNanki Maternal and Child Care Centre (BNMCC), attached to Government Medical College Amritsar to evaluate the risk factors for the need of assisted ventilation. The detailed antenatal, natal and postnatal history was recorded along with the treatment measures and the data was subjected to statistical analysis. **Results:** According to the inclusion criteria 200 cases were enrolled. 38 of them required assisted ventilation and among them, 5 cases had anaemia, 5 cases had Pregnancy induced hypertension, 2 cases had Gestational diabetes mellitus, 2 cases had hypothyroidism and 1 case had intrauterine growth retardation as antenatal risk factor. Remaining 23 cases had no risk factor. Thick meconium, multi gravida and APGAR at 1 min were found to be significant ($p<0.05$) risk factors for the need of assisted ventilation. **Conclusion:** The knowledge of risk factors, prompt and efficient labour monitoring and delivery can minimize the sequel of meconium aspiration syndrome. Further studies are required to substantiate the results.

**Keywords:** Assisted Ventilation, Meconium Aspiration Syndrome, Risk Factors.

## INTRODUCTION

Meconium, the gastrointestinal excreta of fetus was named by Aristotle. It is a sterile, thick, black-green odorless material that results from the debris accumulation in the fetal intestine beginning in the third month of gestation. The components of meconium are water (72% to 80%), desquamated cells from the intestine and skin, gastrointestinal mucin, bile, amniotic fluid, lanugo hair, fatty material from vernix caseosa, intestinal secretions, blood group-specific glycoproteins, and enzymes including phospholipase A2.[1]

Meconium passage in utero and its relationship to potential fetal and neonatal compromise or "fetal distress", are matters of greatest concern in maternal–fetal medicine and

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neonatology.[2] Meconium aspiration syndrome (MAS) is characterized by early onset of respiratory distress in a meconium-stained neonate, with poor lung markedly increased airway resistance and hypoxemia clinically and patchy opacification and hyperinflation radiographically.[3] Meconium stained amniotic fluid occurs in 9% to 22% of live births with increasing frequency along with increase in gestational age of fetus.[4]
Several epidemiological studies conducted so far have identified some important risk factors within the general birth population or among neonates which lead to the development of MAS. Dargaville et al,[3] assessed risk factors for MAS with need for mechanical ventilation in the Australian and New Zealand Neonatal Network cohort and found a higher risk in case of advanced gestation, fetal distress, low Apgar score at 5 min, and certain ethnic factors. Cesarean delivery and advanced gestation have been considered to be associated with a high incidence of MAS.[5,6]

MAS is complex respiratory disease affecting the term and near-term neonates and continues to place a considerable burden on neonatal intensive care resources worldwide.[3] Limited data is available regarding the risk factors for assisted ventilation in babies born through meconium stained amniotic fluid. Hence this study was done to study and help in optimum management of babies born through meconium stained amniotic fluid by predicting the need for assisted ventilation.

## MATERIALS AND METHODS

This was a prospective observational study done on all the mothers admitted with meconium stained amniotic fluid (MSAF) and their babies in BebeNanki Maternal and Child Care Centre (BNMCC), attached to Government Medical College Amritsar from 01-02-2019 to 31-01-2020.

All singleton pregnancy with cephalic presentation, gestational age >37 weeks, primi or multigravida with meconium stained liquor were included in the study. Pregnancies with Multiple gestation, gestation age <37 weeks, fetal Congenital anomaly, malpresentation, intrauterine death, preterm, antepartum haemorrhage and patient not willing to give consent were excluded.
A detailed antenatal history was elicited to find out the etiology of passage of meconium into the amniotic fluid. Natal history and relevant records from the mother's case file were taken, type of delivery and indications for any interventions or drugs used for delivery were recorded. Postnatal history was obtained, Apgar score was noted at 1 min and 5 min, and any other complication and details of resuscitation measures done at birth such as suctioning of the oropharynx after delivery, bag and mask when required, endotracheal intubation done with bag and tube ventilation was recorded. All babies born through MSAF were observed for 48 hours and the stable babies were shifted mother side with danger signs explained and followed up and those symptomatic

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were admitted in ward or NICU as needed.

Appropriate treatment was started after assessing Downe's score and was recorded (oxygen, intravenous fluids, antibiotics, ionotropic support, continuous positive airway pressure ventilation - CPAP, Surfactant if given, anti-convulsants and mechanical ventilatory support as and when required).

**Statistical Methods**

All the data was tabulated and subjected to statistical analysis. Descriptive statistics like ratio and percentage were used. Univariate analysis was done using chi-square test and fisher exact test. Multivariate analysis was done using multivariate logistic regression to find independent risk factors. P value less than 0.05 was considered as significant.

## RESULTS

Out of the total 6033 deliveries that were conducted during the period of study, 415 cases had meconium stained liquor. Hence the incidence of MSAF was 6.8%. 200 cases which met the inclusion criteria were enrolled and followed up for the study.

Among 200 cases of meconium stained amniotic fluid (MSAF), thin meconium constituted 82 cases (41%) and thick meconium constituted 118 cases (59%). Incidence of thick meconium was more as compared to thin meconium. 61% babies were males and 39% were females.

In our study, 56.5% cases were primigravida whereas remaining 43.5% were multigravida. Maximum incidence was observed in age group of mothers between 20-35 years, i.e., 181 cases (90.5%), followed by age group of mothers less than 20 years, i.e., 14 cases (7%) and in those born to mothers in age group more than 35 years i.e., 5 cases (2.5%). 59% mothers had delivery through cesarean section and 41% cases had normal vaginal delivery. Majority of cases (48%) had gestational age of 39-40 weeks followed by gestational age of 37-38 weeks (45%). Only 7% cases had gestational age of 41-42 weeks.

Out of 200 cases, 62.5% cases had no antenatal risk factors, 12% cases had pregnancy induced hypertension (PIH), 8.5% cases had anaemia, 7.5% had hypothyroidism, 4.5% had jaundice, 2.5% had gestational diabetes mellitus (GDM), 1.5% had polyhydrominos and 1% had intrauterine growth retardation (IUGR).

The incidence of occurrence of meconium aspiration syndrome in the present study involving 200 cases was 34%. Out of 68 cases which required oxygen support, 30 cases (44.11%) required nasal prongs, 23 cases (33.82%) required CPAP and 15 cases (22.07%) required intubation and mechanical ventilation.

No antenatal risk factor was found to be significant for the need of assisted ventilation in babies born through MSAF [Table 1].

Multiparity, thick meconium and APGAR at 1 min were found to be

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significant risk factors for need of assisted ventilation in babies born through meconium stained amniotic fluid [Table 2].

**Table 1: Relation of Antenatal Risk Factors with Requirement of Assisted Ventilation**

| Antenatal risk factors | Did not require assisted ventilation | | Required assisted ventilation | | Total | P-Value |
|---|---|---|---|---|---|---|
| | No. Of cases(n = 162) | %age | No. Of cases(n = 38) | %Age | | |
| Anemia | 12 | 7.41% | 5 | 13.16% | 17 | 0.419 |
| Jaundice | 9 | 5.55 % | 0 | 0% | 9 | |
| Polyhydrominos | 3 | 1.85% | 0 | 0% | 3 | |
| Pih | 19 | 11.73% | 5 | 13.16% | 24 | |
| Gdm | 3 | 1.85% | 2 | 5.26% | 5 | |
| Hypothyroidism | 13 | 8.02% | 2 | 5.26% | 15 | |
| Iugr | 1 | 0.63% | 1 | 2.63% | 2 | |
| No risks | 102 | 62.96% | 23 | 60.53% | 125 | |

**Table 2: Comparison of data of babies who required assisted ventilation with those who didn't require assisted ventilation**

| | | Required Assisted Ventilation | Didn't Require Assisted Ventilation | p-value |
|---|---|---|---|---|
| Mean weight | | 2.60 kg | 2.66 kg | |
| Mean gestation | | 38+6 weeks | 38+4 weeks | |
| Type of babies | Vigorous | 68.42% | 77.78% | 0.2241 |
| | Non-vigorous | 31.58% | 22.22% | |
| Type of meconium | Thick | 76.32% | 54.94% | 0.0158 |
| | Thin | 23.68% | 45.06% | |
| Parity of mother | Primigravida | 39.47% | 60.49% | 0.0186 |
| | Multigravida | 60.53% | 39.51% | |
| Mode of delivery | Nvd | 50% | 38.89% | 0.2100 |
| | Lscs | 50% | 61.11% | |
| Booking status | Booked | 78.95% | 79.01% | 0.9929 |
| | Unbooked | 21.05% | 20.99% | |
| Mode of onset of labour | Spontaneous | 84.21% | 84.57% | 0.9563 |
| | Induced | 15.79% | 15.43% | |
| Apgar score at 1 min | 1-3 | 26.32% | 11.11% | 0.0496 |
| | 4-6 | 15.79% | 21.60% | |
| | 7-10 | 57.89% | 67.29% | |
| Apgar score at 5 min | <7 | 6.17% | 10.53% | 0.3438 |
| | ≥7 | 93.83% | 89.47% | |

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**Table 3: Multivariate regression analysis**

| Variable | | Multivariate analysis | |
|---|---|---|---|
| | | Adjusted odds ratio (95% CI) | P-value |
| Parity | Primigravida | - | - |
| | Multigravida | 2.222 (1.068-4.624) | 0.033 |
| Meconium | Thin | - | - |
| | Thick | 1.578 (0.733-3.395) | 0.244 |
| Apgar at 1 min | 7 – 10 | - | - |
| | 1 – 6 | 1.555 (0.741-3.260) | 0.243 |

On multivariate analysis it was seen that only parity is the independent risk factor for requirement of assisted ventilation requirement in babies born through MSAF [Table 3].

## DISCUSSION

Meconium stained amniotic fluid (MSAF), is a commonly observed phenomenon and has been implicated as a factor influencing fetal well-being during the intra-partum and neonatal outcome.

The incidence of MSAF was found to be 6.8% in our study. The incidence reported was 9.37% with Gokhroo K et al, 10.40% with Linder et al, 9.80% with Goud P and Krishna U, 14% with Arun H Nayek et al and 11.20% with Hari Bhaskar S et al.[4,7-10] Variable incidence was observed in different studies due to differences in the study population.
Higher incidence of MSAF (56.5%) was seen in Primigravida. This study was correlating with the study done by Kamala Ghokroo et al.[7] In our study, majority of cases (48%) had gestational age of 39-40 weeks whereas in study done by Hiremath PB et al,[11] 36% had gestational age from 40 – 42 weeks and 40 % cases had gestational age > 42 weeks. Majority of MSAF delivered through caesarean section which was similar to the study of Wong et al.[12]

The incidence of occurrence of meconium aspiration syndrome in the present study involving 200 cases was 34%. Out of cases which required oxygen support, 44.11% cases required nasal prongs, 33.82% required CPAP, 22.07% required intubation. Liu et al and Adhikari et al reported that between 40 and 50% of infants with MAS will need Mechanical ventilation.[13,14]Wiswell TE et al found that 29.7 % required mechanical ventilation.[15]

Kamala et al,[7] found 8.66% had hypertension, 6% had anemia and 85.34% didn't have any antenatal risk factor. Bhide SS et al,[16] found that 13.85% had hypertension, 6% had anemia and 80.15% didn't have any antenatal risk factor. This coincided with our study where out of 200 cases, 62.5% cases had no antenatal risk factors, 12% cases had PIH, 8.5% cases had anaemia, 7.5% had hypothyroidism, 4.5% had jaundice, 2.5% had GDM, 1.5% had

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polyhydrominos and 1% had IUGR and therefore majority of the mothers with MSAF did not have any associated antenatal risk factor. So intrapartum monitoring is very important even when no risk factors are present.

Dargaville et al,[3] assessed risk factors for MAS with need for mechanical ventilation in the Australian and New Zealand Neonatal Network cohort and found a higher risk in case of advanced gestation, fetal distress, low Apgar score at 5 min, and certain ethnic factors. In our study, out of 113 Primigravida cases, 15 required assisted ventilation and out of 87 Multigravida cases, 23 required assisted ventilation. Multigravida was found to be significant risk factor associated with assisted ventilation. In our study, 29 babies with thick meconium required assisted ventilation while 9 babies with thin meconium required assisted ventilation. Thick meconium was found to be significant risk factor associated with assisted ventilation ($p>0.05$). The relation of Apgar Score at 1 min with requirement of assisted ventilation was also found to be significant ($p<0.05$). On multivariate regression analysis, multiparity was identified as an independent risk factor for requirement of assisted ventilation. Very few studies are available in literature regarding the risk factors for assisted ventilation in babies born through meconium stained amniotic fluid.

## CONCLUSION

Meconium aspiration syndrome has been found to be one of the major causes of morbidity and mortality in babies with meconium stained amniotic fluid (MSAF). In our study multiparity, thick meconium and APGAR at 1 min were found to be significant risk factors and among them multiparity was found to be independent risk factor in determining the need of assisted ventilation. Presence of any maternal risk factors like pregnancy induced hypertension, gestational diabetes, anaemia, hypothyroidism, jaundice, polyhydrominos, intrauterine growth retardation, presence of thick meconium warrants meticulous monitoring of both mother and baby and intervention when needed. Prompt and efficient labour monitoring and delivery can minimize the sequel of meconium aspiration syndrome. Since all fetuses with meconium passage in labour do not have associated maternal risk factor and do not have adverse outcome, Knowledge of risk factors predicting the need for assisted ventilation can help in anticipation and better planning of management of sick meconium aspiration syndrome babies. However, more studies are needed to know better picture of risk factors predicting the need for assisted ventilation as very few studies have been done to know the risk factors for assisted ventilation in babies born through MSAF.

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