



FACTORS INFLUENCING MORTALITY IN NEONATES WITH MECONIUM ASPIRATION SYNDROME

Paediatrics

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ABSTRACT

The most important consequence of a neonate born through meconium-stained amniotic fluid is MAS, a serious neonatal disorder with high morbidity & mortality. MAS manifests with respiratory distress, hypoxemia, meconium below the vocal cords & a chest X-ray showing hyperinflation, patchy infiltrates, and occasional air leaks. Timely interventions before and after delivery can prevent this condition. This study provides a morbidity & mortality profile of neonates with MAS. It is a prospective observational study of 100 neonates born through meconium-stained amniotic fluid & developing respiratory distress within the first 24 hours of life at Navodaya Medical College. The effects of thin & thick meconium on the fetus, gestational age, birth weight, Apgar scores at 1&5 minutes & outcomes in terms of morbidity & mortality were recorded. Among the 100 cases of MAS, 66% were males & 34% were females. Male & female mortality rates were 32% & 29%, respectively. Mortality rates were 62% for preterm and 29% for term babies. Babies weighing < 2.5 kg had a 50% mortality rate, while those weighing between 2.5-3.5 kg had a 28% mortality rate. Mortality was 6% for thin meconium and 53% for thick meconium. Among the cases that died, 13% were delivered vaginally & 37% by Caesarean section. Mortality rates for babies with Apgar scores <1 at 1 minute & <5 at 5 minutes were 86%. Of those requiring mechanical ventilation, 84% died. Mortality rates for those with PPHN, HIE, sepsis, myocardial dysfunction & pneumothorax were 18%, 44%, 60%, 69% & 33%, respectively. Overall 52% of the cases experienced morbidity & 31% mortality. The most common morbidities were HIE & myocardial dysfunction with the highest mortality seen in cases of myocardial dysfunction & sepsis. This study indicates that MAS can lead to significant morbidity & mortality which can be mitigated through early detection of risk factors & improved perinatal & neonatal care.

KEYWORDS

Meconium Aspiration Syndrome; meconium.

INTRODUCTION:

The most significant consequence for a neonate born through meconium-stained amniotic fluid is Meconium Aspiration Syndrome (MAS), occurring in 1-3% of live births. Meconium, the first feces of a newborn, is a greenish, thick and viscous substance formed during the third intrauterine week, composed of bile residue, desquamated skin, hair and intestinal cells. MAS is defined by the presence of meconium below the vocal cords. Gasping and deep breathing often due to sustained hypoxia or ischemia, predispose the infant to aspirate meconium, creating sufficiently negative intrapulmonary pressure to draw fluid into the lungs. Aspiration of meconium before or during birth can obstruct airways, hinder gas exchange and cause severe respiratory distress.

Maternal factors such as placental insufficiency, maternal hypertension, pre-eclampsia or maternal drug abuse can lead to the in utero passage of meconium. MAS is a serious condition characterized by respiratory distress, pulmonary inflammation and hypoxemia with a case fatality rate approaching 40%. Risk factors for developing MAS include Caesarean delivery, thick meconium-stained amniotic fluid (MSAF), male gender, low Apgar scores and the presence of meconium below the vocal cords. Radiographically, meconium aspiration results in mechanical obstruction with an increased incidence of air leaks, reduced surfactant activity, chemical pneumonitis and an inflammatory response. Complications of MAS include pneumothorax, pneumonia, and Persistent Pulmonary Hypertension of the Newborn (PPHN). The mortality rate for meconium-stained newborns is higher than for those not stained.

Aims And Objectives :

The morbidity and mortality profile of neonates with MAS.

Methodology:

A prospective observational study was done in Navodaya Medical College Hospital and Research Centre, Raichur for a period of 1 year with sample size of 100 cases of Meconium Aspiration Syndrome.

Inclusion criteria:

All neonates with MAS irrespective of gestation & birth weight, thick and thin MSAF, neonates with respiratory distress within first 24 hours of life, neonates with following morbidities: PPHN, HIE, myocardial dysfunction, pneumothorax, sepsis.

Exclusion criteria:

Neonates developing respiratory distress after 24 hours.

Statistics:

Data was entered into SPSS 27 software. Categorical variables will be compared. p value of <0.05 will be considered significant.

RESULTS:

Following data is obtained from a study involving 100 cases of MAS in NMC in Raichur.

Incidence based on sex and related mortality:

In our study 66(66%) were males and 34 (34%) were females. 45(68%) of male babies with MAS survived and 21(32%) died. 24(71%) of female babies survived and 10(29%) died due to morbidities.

Association of period of gestation and complications:

In our study 13(13%) of the babies were preterm, 78(78%) were term, and 9 (9%) were post term babies. In preterm 4(31%) had HIE, 3(23%) had sepsis, 4(31%) had myocardial dysfunction. In term 11(14%) had PPHN, 35(45%) had HIE, 16(21%) had sepsis, 22(28%) had myocardial dysfunction and 2(3%) had pneumothorax. In post term babies 4(50%) had HIE, 1(12.5%) had sepsis, 1(12.5%) had pneumothorax.

Association of period of gestation and mortality:

In preterm babies out of 13(13%), 5(38%) survived and 8(62%) died. In term babies out of 78(78%), 55(71%) survived and 23(29%) died. In post term babies out of 9(9%) all of them survived 9(9%). p value is 0.007 which is significant.

Association of birth weight with morbidity:

In our study 20(20%) out of 100 babies were <2.5 kg, 77(77%) were between 2.5-3.5 kg, 3(3%) were >3.5 kg. Among the 20(20%) of the babies weighing <2.5 kg, 1(5%) had PPHN, 8(40%) had HIE, 6(30%) had sepsis, 8(40%) had myocardial dysfunction. 77(77%) of the babies weighing between 2.5 to 3.5 kg, 10(11%) had PPHN, 34(44.2%) had HIE, 13(16.9%) had sepsis, 17(17%) had Myocardial dysfunction and 3(3%) had pneumothorax. 3(3%) of the babies weighing >3.5 kg, 1(33.3%) had HIE.

Association of birth weight with mortality:

In our study 20(20%) babies were weighing <2.5 kg out of which 10(50%) survived and 10(50%) died. 77(77%) babies were weighing between 2.5 and 3.5 kg out of which 56(73%) survived and 21(28%) died. 3(100%) babies were weighing >3.5 kg and all survived 3(100%).

Type of meconium and morbidities:

In our study 47(47%) were thin meconium stained and 53(53%) were

thick meconium stained. In thin meconium stained cases 6(12.8%) had PPHN, 14 (29.8%) had HIE, 4(8.5%) had sepsis, 3(6.4%) had myocardial dysfunction and 1 (2.1%) had pneumothorax. In thick meconium stained cases 5(9.4%) had PPHN, 29 (54.7%) had HIE, 16(30.2%) had sepsis, 23(43.4%) had myocardial dysfunction, 2(3.8%) had pneumothorax.

Type of meconium and relation to mortality:

In our study out of 47(47%) thin meconium stained 44(94%) survived and 3 (6%) died and out of 53(53%) of thick meconium stained cases 25(47%) survived and 28(53%) had died. p value is 0.000 which is significant.

Apgar score at 1min and relation to mortality:

Apgar score at 1min : <5 total no. of cases were 22(22%) out of which 3(14%) had survived and 19(86%) had died. 5-6: total no. of cases were 30(30%) out of which 22(73%) had survived and 8(27%) had died. >7: total no. of cases were 48(48%) out of which 44(92%) had survived and 4(8%) had died. p value is 0.001 which is significant.

Apgar score at 5min and relation to mortality:

Apgar score at 5 min : <7 total no. of cases were 7(7%) out of which 1(14%) had survived and 6(86%) had died. 7-8: total no. of cases were 22(22%) out of which 5(23%) had survived and 17(77%) had died. 9 : total no. of cases were 71(71%) out of which 63(89%) had survived and 8(11%) had died. p value is 0.000 which is significant.

Need for mechanical ventilation and no. of babies survived and dead on ventilator:

Out of 100 cases of MAS 32(32%) required mechanical ventilation 5(16%) survived and 27(84%) died. p value of 0.000 which is significant.

Table 1: Incidence of morbidity and incidence of mortality in the morbid cases

	PPHN	HIE	SEPSIS	myocardial dysfunction	pneumothorax
no. of cases	11	43	20	26	3
survived	9	24	8	8	2
dead	2	19	12	18	1

Incidence of PPHN was 11% out of which 9(82%) survived and 2 (18%) died. Incidence of HIE was 43(43%) out of which 24(56%) survived and 19(44%) died. Incidence of sepsis was 20(20%) out of which 8(40%) survived and 12(60%) died. Incidence of myocardial dysfunction was 26(26%) out of which 8(31%) survived and 18(69%) died. Incidence of pneumothorax was 3(3%) out of which 2(67%) survived and 1(33%) died. p value is 0.010 which is significant.

Total outcome of the study:

Out of the 100 cases of MAS 52(52%) had morbidities and 31(31%) had mortality.

DISCUSSION:

In our study 66(66%) were males and 34(34%) were females. In a study by Mehmmob shaik et al 44(61.18%) were males and 28(38.9%) were females. In a study by Deepak Louis et al 101(59.4%) were males and 69(40.6%) were females. In our study 21(32%) of males and 10(29%) of females have died. In a study by Deepak Louis et al 24(55%) of the females out of 69(40.6%) females babies have died. In our study 13(13%) were preterm, 78(78%) were term and 9(9%) were post term. In a study done by Mohammed kazeem sabzehei et al 15.9% were preterm, 67% were terms, 17.4% were post terms. In a study done by Gupta et al 7.8% were preterm, 86.7% were terms, 5.3% were post term.

Period of gestation associated mortality: In our study out of 13 preterm 5(38%) survived and 8(62%) have died, out of 78 term 55(71%) have survived and 23(29%) have died, out of 9 post term 9(100%) have survived. In a study done by Md kazeem sabzehei et al out of 10 preterm 8(80%) have survived and 2(20%) have died, out of 42 term 35(85.3%) have survived and 7(16.6%) have died, out of 11 post term 11(100%) have survived. In a study done by Deepak Louis et al out of 37(20.6%) preterm 25(20%) have survived and 12 (27%) have died.

Association of period of gestation with morbidity: Among the preterm 4(31%) had sepsis which was the major morbidity seen in

them 2nd being HIE 3(23%). Among the term babies the two major cause of morbidity seen was HIE(45%) and 22(28%) myocardial dysfunction. Among the preterm babies again HIE 4(50%) was the most common cause of morbidity.

Association of birth weight with mortality: Among the babies with birth weight of <2.5kg, 10(50%) survived, 10(50%) were dead, babies with birth weight of 2.5kg-3.5kg, 56(73%) survived, 21(28%) were dead and babies with birth weight of >3.5kg, 3(3%) survived, 0 were dead. In a study done by MD KAZEEM SABZEHEI ET AL the babies with birth weight of <2.5kg, 7(77.7%) survived, 2(22.2%) were dead, babies with birth weight of 2.5kg-3.5kg, 47(87.03%) survived, 7(13%) were dead and babies with birth weight of >3.5kg, 47(87.03%) survived, 7(13%) were dead.

Association of birth weight with morbidity: Among the babies weighing <2.5kg major cause of morbidity were HIE 8(40%) and myocardial dysfunction. In babies weighing between 2.5-3.5kg, HIE 34(44.28%) was the most common morbidity & in babies >3.5kgs again HIE 33% was the major cause of morbidity.

Relation between type of meconium and MAS and its related mortality

a) Type of meconium and MAS : In our study 7(47%) were thin meconium stained and 53(53%) were thick meconium stained. In a study done by Helat Vora et al 26.66% were thin meconium stained and 73.3% were thick meconium stained.

b) Type of meconium in relation to mortality: In our study 47(94%) have survived and 3(6%) have died among the thin stained liquor 25(47%) have survived among thick stained meconium liquor and 28(53%) have died among them. In a study by Deepak Louis et al out of 168 cases of thick MSL 98(78) have survived and 36(82%) have died.

Apgar at 1 minute and relation to MAS and its mortality: In our study number of case with Apgar < 5 at 1 minute was 22(22%), 5-6 was 30(30%) & 7 was 48(48%). In a study done by Miller et al Apgar <5 at 1 minute was 14.10%, 5-6 was 11.30%, 7 was 74%.

Apgar at 1 minute and mortality: In our study number of cases died having apgar <5 at 1 min were 19(86%), 5-6 were 8(27%) and >7 were 4(8%). In a study done Md kazeem sabzehei et al number of cases died having apgar <7 at 1 min were 2(5.8%) and >7 were 7(24.1%).

Apgar at 5 minutes and relation to MAS: In our study number of cases with apgar < 7 were 7(7%), between 7-8 were 22(22%) and 9 were 71(71%) were at 5 minutes. In a study done by Md kazeem sabzehei et al number of cases with apgar < 7 were 17(26.9%), number of cases with apgar > 7 were 45(71.4%).

Apgar at 5 minutes and relation to mortality: In our study 6(86%) have died having Apgar <7, 17(77%) have died has Apgar between 7-8 and 8(11%) died having Apgar of 9 at 5 minutes. In a study done by kazeem sabzehei et al 6(35%) have died having Apgar < 7 and 3(6.6%) died having Apgar > 7.

Need for MV and its relation to mortality: In our study out of 32 ventilated babies 27(84%) died. In a study conducted by Md kazeem sabzehei et al out of 20 ventilated babies 9(45%) died.

Incidence of morbidity and its associated mortality: In our study 43% had HIE, 20% had sepsis, 26% had myocardial dysfunction, 11% had PPHN & 3% had pneumothorax. In a study by Deepak Louis et al, PPHN, HIE, myocardial dysfunction and pneumothorax was seen in 29(17%), 37(22%), 79(46%) and 37(22%), 7(4%) neonates respectively. In a study by Hetal Vora et al 4(4.4%) developed PPHN and 27(30%) had sepsis. The present study shows the major cause of mortality is due to myocardial dysfunction which has been shown in a similar study done by Deepak Louis et al. 29 of 66 cases have died in their study whereas in our study 18 out of 26 cases have died with myocardial dysfunction. In the present study a significant relationship between the incidence of MAS in term gestation and mortality associated with thick meconium stained liquor, apgar score <5 at 1 minute, apgar score <7 at 5 minutes, need for mechanical ventilation and the incidence of morbidity was noted.

CONCLUSION:

Among 100 cases of MAS, 52(52%) had morbidity and 31% had

mortality. Morbidity profile which was seen in neonates were HIE, Myocardial dysfunction, Sepsis, PPHN, and Pneumothorax, majority being HIE and Myocardial dysfunction. Mortality was more in cases of Myocardial dysfunction and Sepsis. The presence of thick meconium was found to be an important factor in causing morbidity and mortality. Patients without complications have excellent outcome without mortality. So the study concludes that MAS is a significant cause of morbidity and mortality which can be reduced by early detection, prompt delivery and neonatal resuscitation.

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