

ORIGINAL ARTICLE

DETRIMENTAL COMPLICATIONS OF MECONIUM ASPIRATION SYNDROME AND THEIR IMPACT ON OUTCOME

Mehmood Shaikh, Khawaja Ahmad Irfan Waheed, Sulman Javaid, Rafia Gul, Muhammad Almas Hashmi*, Syeda Tehseen Fatima**

Department of Neonatology, *Department of Gastroenterology, **Department of Statistics The Children's Hospital & The Institute of Child Health, Lahore-Pakistan

Background: Meconium aspiration syndrome (MAS) is respiratory distress in an infant born through meconium stained amniotic fluid (MSAF) whose signs cannot be otherwise explained. MAS is associated with different complications. Many studies have been conducted in developed world to find the outcome associated with MAS but data from developing countries is lacking. Present study was conducted to determine the impact of chemical pneumonitis, pulmonary hypertension (PHN) and air leak on outcome of new-borns with MAS. **Methods:** This cross sectional descriptive study was conducted in a tertiary care Neonatology unit. The babies diagnosed with MAS were included in the study. All patients were monitored for development of complications. Outcome in terms of mortality was recorded. Outcome was compared by chi-square test and p -value <0.05 is considered significant. **Results:** Seventy two babies were included in the study. Mean gestation was 37 ± 0.56 weeks and birth weight was 2.87 ± 0.49 kg. Male to female ratio was 1.57:1 and mean age of admission was 9.59 ± 5.27 hours. Chemical pneumonitis, PHN and chemical pneumonitis with PHN were observed in 23.6%, 20.8% and 26.4% neonates respectively. Mortality rate was 19.44%. The mortality was highest in babies having chemical pneumonitis with PHN (p -value=0.013) followed by chemical pneumonitis group (p -value=0.02) and PHN group (p -value=0.032). **Conclusion:** About three fourth babies with MAS developed one or more complications. Mortality is significantly increases with the development of complications so as more the complications more is the mortality.

Keywords: Meconium Aspiration Syndrome; Chemical Pneumonitis; Persistent Pulmonary Hypertension.

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INTRODUCTION

Meconium aspiration syndrome (MAS) is described as respiratory distress in an infant born through meconium stained amniotic fluid (MSAF) whose signs cannot be otherwise explained.¹ MSAF signifies underlying foetal hypoxia and is found in 10–15% of live births.^{2,3} About 2–9% of infants born through MSAF develop MAS.⁴

Globally, every year 2.6 million neonates die and three-fourths of these deaths occur in the first week of life.⁵ Pakistan has one of the highest neonatal mortality rate in the world, i.e., 55/1000 live births.^{6,7} MAS is one of the leading cause of perinatal mortality.⁸ According to a study, 27.3% of neonatal deaths had a history or evidence of meconium passage during delivery.⁹

Meconium aspiration syndrome is a frequent cause of admission in neonatal departments. Neonates with MAS present at or just after delivery with marked respiratory distress and hypoxemia with X-Ray chest showing hyperinflation, patchy infiltrates and occasional air leaks.¹⁰

Meconium aspiration syndrome is associated with multiple life threatening complications including hypoxic ischemic encephalopathy (HIE) (46%),

hypotensive shock (22%), pneumothorax (11.4%), myocardial dysfunction (22%) and pulmonary hypertension (PHN) (17%).^{11,12}

Many studies have been conducted in developed world to find the outcome associated with MAS but data from developing countries like Pakistan is lacking. This study has been designed to fill in this gap. This study shall help in anticipating the problems associated with MAS in our set-up that shall ultimately lead to improved outcome of such babies.

MATERIAL AND METHODS

This was a cross sectional descriptive study conducted at Neonatology Department, The Children's Hospital and The Institute of Child Health, Lahore, for a period of 6 months from March to August 2015. The study was initiated after approval from the Institutional Review Board and obtaining informed consent from the parents/guardian. All the new-borns having meconium staining of skin and respiratory distress in the presence of MSAF with onset within first 24th of life were labelled as meconium aspiration syndrome (MAS) and were included in the study by consecutive

non-probability sampling; until the desired number of patients was completed.

Respiratory distress was defined as respiratory rate more than 60 breaths per minute, with intercostal or subcostal in drawing, sternal retraction and a predominantly diaphragmatic breathing pattern.¹³

Pulmonary hypertension (PHN) was defined on the basis of pre- and post-ductal oxygen saturation difference of >10% with or without the presence of echocardiographic evidence of PHN, i.e., peak velocity of a tricuspid regurgitate jet with a peak pulmonary pressure gradient of >20 mmHg.¹¹

Air leak was defined as an accumulation of extra-pulmonary air within the chest and chemical pneumonitis was defined as signs of respiratory distress with reduced air entry or crepitation with radiological evidence of diffuse patchy infiltrates, atelectasis mixed with areas of hyperinflation throughout the lung fields.^{14,15}

Babies with congenital lung anomalies, congenital heart diseases or respiratory distress due to any other disease that could not be explained on meconium aspiration syndrome were excluded from the study.

Data include, history, examination and outcome was collected on specially designed *pro forma*. Investigations included CBC, CRP and chest X-Ray was done. Echocardiography of all patients was done by a consultant Paediatric Cardiologist at the Department of Paediatric Cardiology, The Children's Hospital & The Institute of Child Health, Lahore. All patients were managed in with minimal handling; haemoglobin was maintained above 12 g/dl, oxygen inhalation to maintain oxygen saturation above 95%. Patients not maintaining blood pressure were given inotropic support in the form of dopamine and dobutamine and blood glucose was maintained above 45 mg/dl. Arterial blood gases were done 12 hourly. Patients were intubated and started on mechanical ventilation if $PO_2 < 50$ mmHg, $PCO_2 > 60$ mmHg, $PH < 7.2$ and $FIO_2 > 0.6$.

Patients not maintaining oxygen saturation on conventional ventilation were shifted on high frequency oscillatory ventilation. PPH was managed by vasodilator (sildenafil 0.25–0.5 mg/kg/dose 6 hourly per orally; increasing to 2mg/kg/dose 6 hourly; total 8 doses). Repeat echocardiography was done after 48 hours in all patients with PPH.

All patients were monitored for development of complications including chemical pneumonitis, air leak and pulmonary hypertension. Short-term outcomes of the neonate that were measured in terms of discharge and death and duration of hospital stay. Results were analysed using SPSS-20. Qualitative variable were presented as

mean and standard deviation, while quantitative variables presented in frequency and percentages. Chi-square test was used to compare the variables. p -value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 96 cases of MAS were initially included in the study. Out of those 4 cases were found to have congenital lung anomalies, 12 had congenital heart diseases and 8 had respiratory distress due to other causes which could not be explained on meconium aspiration syndrome. Therefore, total of those 24 babies were excluded from the study and the remaining 72 patients were finally included in the study and their data was subjected to further analysis. Out of 72 babies 44 were males (61.11%) and 28 were females (38.9%) resulting in male: female ratio of 1.57:1. Mean age at admission was 9.59 ± 5.27 hours (Figure-1), mean birth weight was 2.87 ± 0.49 kg (Figure-2) and mean gestational was 37 ± 0.56 weeks.

The deliveries through caesarean section were carried out in 33 (45.8%) cases while 39 (54.2%) babies were born through spontaneous vaginal delivery. Mean age at the onset of respiratory distress was 3.02 ± 2.20 hours.

Out of 72 babies with MAS, 21 babies (29.2%) did not develop any studied complication while 51 (70.8%) were found to have one or more complications. Chemical pneumonitis was found in 17 (23.6%), PHN in 15 (20.8%) and chemical pneumonitis with PHN was observed in 19 (26.4%) neonates. None of the patients had air leak.

The mean duration of the hospital stay among those who survived was 87.41 ± 54.60 hours while the mean duration of the hospital stay among those who expired was 122.28 ± 55.89 hours. Hospital stay among patients with different complications is described in (Figure-3). Out of 72, 14 (19.44%) patients died while 58 (80.56%) were discharged. The mortality was highest in babies having chemical pneumonitis along with PHN (6/19, p -value=0.013) followed by chemical pneumonitis (3/17, p -value=0.02) and PHN alone (5/15, p -value=0.032).

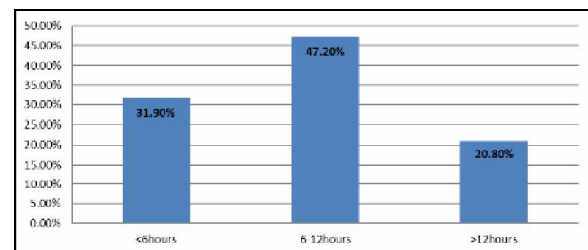


Figure-1: Age at the time of admission

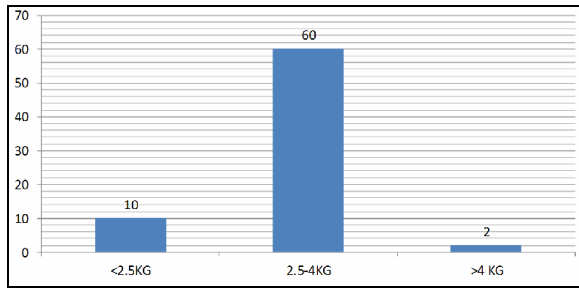


Figure-2: Birth weight

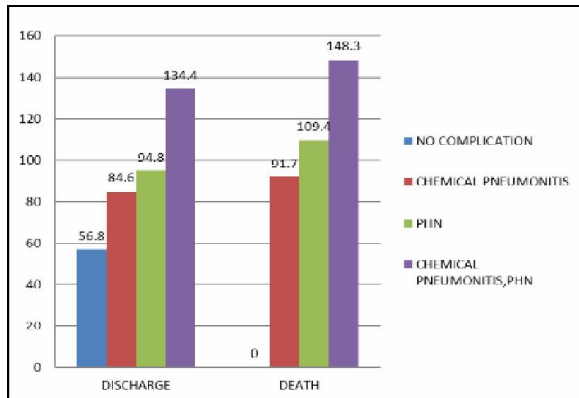


Figure-3: Duration of hospital stay in hours associated with complication

DISCUSSION

The mortality of MAS in children born with MSAF has decreased over the years particularly in the developed countries. Dargaville estimated the neonatal mortality in Australian population due to MAS to be 2.5%.¹⁶ In a study conducted in a tertiary hospital in Lahore-Pakistan, Anwar found the mortality rate in MAS was 32%.⁹ The mortality rate of 19.4% in our study is quite different from the studies done by Dargaville & Anwar.^{9,16} The difference in results can be explained on the basis of variation in study population. The Australian study by Dargaville is focused only on babies delivered in the institution while Anwar included both babies delivered in the institution and those delivered at home or other clinics. Current study was based only on out of institution born babies.

Bonde and Wilcox have highlighted the issue of gender discrimination in South Asia results in seeking less care for the girls as compared to boys.¹⁷ A similar trend is also reflected in our study with 1.5:1 male to female ratio:

In a study conducted by Karabayir in Istanbul, Turkey, 43% of MAS new-borns were born through C-section.¹⁸ Masood also presented the similar results in his study conducted in Lahore, Pakistan where 40% babies diagnosed as MAS were delivered through C-section.⁸ The results are in conformity with our study where C-section was

found to be the mode of delivery in 45.8% (n=33) of studied babies.

The mean duration of hospital stay in patients with MAS has been found to be variable in different studies.^{9,11} In our study it was calculated to be 87.41±54.60 hours in those who were discharged and 122.28±55.89 hours in those who expired. This shows that the patients of MAS with severe complications had prolonged stay than the uncomplicated cases that recovered soon and were discharged.

Zagariya demonstrated that meconium acts as a chemical irritant leading to pneumonitis and lung injury through cytokine mediated pathway.¹⁹ In our study 23.6% cases were found to have features suggestive of chemical pneumonitis. Many studies have found MAS to be the commonest cause of PHN.^{12,20-23} Pulmonary hypertension developed in 36 patients (50%) in our study which is consistent with a Korean study done by Lee.²¹ Fischer has found a 17% incidence of pulmonary hypertension in French neonatal population having MAS.¹² This variation in results may be due to difference in guidelines for surfactant therapy whereby liberal use of surfactant in neonates with MAS was adopted in Fischer's study, which is known to reduce the development of pulmonary hypertension.¹² No baby in our study fulfilled the criteria of surfactant administration.

Air leak is another documented complication of MAS. Velaphi found its frequency to be 24% in neonates having MAS.²⁴ However, no patient developed air leaks in our study. Mechanical ventilation has been implicated as a risk factor for development of pneumothorax in MAS. The difference in our studies may be because 28.6% cases of MAS were ventilated in study by Velaphi as compared to only 8.3% cases in our study.

CONCLUSION

About three fourth babies with MAS developed one or more complications. MAS complicated by PHN and chemical pneumonitis has worst outcome in terms of both longer hospital stay and higher mortality, followed by PHN and Chemical pneumonitis alone. Patients without complications have excellent outcome with no mortality observed.

AUTHORS' CONTRIBUTION

MS: Conceptualizing of study design, data collection, and literature search. KAIW, SJ and MAH: Help in write-up, data interpretation, proof reading. RG: Literature search, proof reading. STF: Data analysis.

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Address for Correspondence:

Dr. Mehmood Sheikh, Room No. 405, Male Doctor's Hostel, The Children's Hospital & ICH, Ferozepur Road, Lahore-Pakistan

Cell: +92 322 313 7045

Email: mehmood_shaikh78@yahoo.com