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Original Research Article

Meconium Aspiration and Its Outcome during Perinatal Period: A Prospective Study

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Abstract:

Introduction: When debris builds up in the fetal gut, it produces meconium, a thick, sterile, green, odorless substance. Meconium is made up of water, desquamated skin and intestinal cells, gastrointestinal mucus, lanugo hair, fatty material from the vernix caseosa, intestinal secretions, amniotic fluid, blood group-specific glycoprotein, bile, and drug metabolites. Typically, babies pass meconium only after delivery. On the other hand, meconium transit by the fetus in utero is linked to 8–15 percent of births. Following an episode of fetal hypoxia, it is generally accepted that meconium passes once the gut is stimulated and the anal sphincter relaxes. Small for date babies and post-mature babies have increased rates of meconium-stained amniotic fluid.

Materials & Methods: The obstetricians closely observed the progression of labor, the consistency and length of meconium staining, and any indication of fetal distress such as bradycardia (less than 120 beats per minute), tachycardia (more than 160 beats per minute), or fetal heart irregularity in all moms who were diagnosed with MSAF. The attending team of obstetricians made the decision about a spontaneous, induced, assisted, or surgical birth depending on the different maternal circumstances and the presence or absence of fetal distress.

Results: As can be seen from the data, 62.66% of the population lives in rural areas. Three quarters of the cases are from urban populations (32.28%), while 5.06 percent are from tribal populations. As a result, the majority of cases are associated with rural population. Ninety-nine percent of the 158 newborns with meconium staining were large for date (LFD), whereas 128 babies (81.02%) were appropriate for date (AFD). In our study, MSAF was encountered by 128 (8.10%) babies out of 1580 AFD babies, 15 babies (10.06%) out of 149 SFD babies, and 15 (32.06%) out of 46 LFD babies.

Conclusion: The current study concludes that paediatricians and obstetricians routinely treat symptomatic MAS and MSAF. Postmaturity is the primary risk factor for multiple systemic artery fibrillations (MSAF). The chance of MSAF is greatly increased by additional obstetric risk factors, such as the existence of fetal distress. Oligohydramnious is highly associated with MSAF, and the thick meconiurn is more often associated with MAS symptoms. A selective approach may be utilized for infants with MSAF, conserving intratracheal suctioning for weak or depressed neonates. All the other infants need is attentive observation after the oro-nasopharyngeal suctioning is finished. Furthermore, births with MSAF, which are closely associated with birth asphyxia, are a common cause of neonatal deaths.

Introduction

Meconium is a thick, sterile, odourless substance that is green and black that develops as foetal intestinal detritus builds up. Water, desquamated skin and intestinal cells, gastrointestinal mucus, lanugo hair, fatty material from the vernix caseosa, intestinal secretions, amniotic fluid, blood group-specific glycoprotein, bile, and drug metabolites are the constituents of meconium [1,2]. Normally, babies pass meconium only after delivery. Nonetheless, meconium transit by the foetus in pregnancy is linked to 8 to 15 percent of all births. [1, 2, 3, 4,5]. Most people agree that after a period of foetal hypoxia, meconium passes once the gut is stimulated and the anal sphincter relaxes [6,7,8]. Meconium-stained amniotic fluid is more common in small-for-date and post-mature newborns.[8,9,10] Meconium aspiration syndrome, which causes hypoxemia, hypercapnia, and acidosis, is the development of respiratory distress following delivery accompanied by radiographic evidence of aspiration pneumonitis in the presence

of meconium staining of fluid, nail, umbilical cord, or skin [l, 11].

Although the syndrome's pathogenesis is unclear, it is linked to a high rate of morbidity and death in newborns [11, 12]. It is said to be the cause of 12–57 percent of newborn respiratory distress episodes in India. [11,13, 14]. In our nation, respiratory problems in newborns account for between 29 and 54 percent of all perinatal mortality [11,13,15,16,17,18,19].

Meconium aspiration can happen during pregnancy or during the baby's first breaths. A better knowledge of the pathophysiology of meconium aspiration syndrome (MAS) has shown that many of these instances are not incidentally linked to meconium aspiration per se, but rather are the result of various pathologic processes that occur in utero, namely persistent hypoxia and infection [19,20].

Babies with the thickest meconium and those who are sad from birth are the most vulnerable to MAS. [19, 20]. The unavoidable character of aspiration in utero as an antepartum process is indicated by the occurrence of MAS in spite of appropriate intra- and postpartum oropharyngeal and tracheal suctioning [19,20, 21].

The severity of MAS can vary, presenting with moderate tachypnea to severe refractory respiratory failure that can be fatal. A neonate with MAS may experience bleeding symptoms, brain hypoxia, renal failure, cardiac and hepatic failure, and prolonged pulmonary hypertension [8,20,21].

The literature contains no data to support the use of preventive antibiotics in MAS. In cases with MAS without prenatal risk factors for infection and without ventilator usage, the clinical course and prognosis associated to infection were unaffected by antibiotic therapy.[8,22]

As of right now, there is not enough information accessible in the literature about the occurrence, cause, and consequences of MAS in the state of Orissa. It has been decided to conduct this study in our hospital, S.C.B Medical College, Cuttack, in light of the birth concern.

Materials & Methods

The current prospective hospital-based study was carried out on infants in the labour rooms of the SCB Medical College, Cuttack departments of paediatrics and obstetrics and gynaecology from December 2013 to September 2015.

Inclusion Criteria:

- All babies delivered by normal, instrumental or caesarean section at the delivery room of SCB medical college, Cuttack were included in the series.
- Babies who had MSAF were taken as cases where as newborn babies without such observation was taken as control.

Exclusion Criteria:

- All babies who were nonviable, stillborns or with lethal congenital anomalies were excluded from the series.
- Babies of mothers with documented evidence of chorioamnionitis were also excluded from the series.

Methods

Using research Pro forma, every single case (mothers with MSAF) that was chosen was asked about their prenatal history, demographic makeup, prior obstetric history, etc.

At least one paediatrician and one obstetrician with training attended every delivery. Upon receiving the newborns, they were immediately placed under a radiant warmer, and the attending paediatrician quickly assessed each one to see whether or not they were energetic. When a newborn exhibits robust breathing attempts, well-defined muscles, and a heart rate over 100 beats per minute, they are said to as energetic. The paediatrician continued with thorough oropharyngeal suctioning, drying the infant, and other standard care when the baby was agitated. Tracheal suctioning was not necessary.

However, the child was intubated right away with a sterile disposable endotracheal tube (size 2.5, 3.0, or 3.5 mm) using a direct laryngoscope and a Miller No. O straight blade when they showed signs of depression, such as inadequate respiratory effort, limping, and a heart rate of less than 100 beats per minute. After being immediately linked to the suction device, the endotracheal tube is progressively removed and the process is repeated until very little more meconium is retrieved.

Meconium that had been aspirated was gathered into a container, and its volume was calculated. Even in the depressed newborns, positive pressure breathing with an Ambu bag was not started until the meconium had been removed from the trachea. For every baby, the APGAR scores were noted after one, five, and ten minutes. All newborns from MSAF had their stomach contents aspirated using an infant feeding tube. Normal saline was used to cleanse the stomach. Regardless of other circumstances, all neonates delivered with meconium-stained liquor were sent to a NICU or specialised care newborn unit (SCNU).for a minimum of 12 hours of observation, and if necessary, for further treatment.

The obstetricians closely observed the progression of labour, the consistency and length of meconium staining, and any signs of foetal distress such as bradycardia (less than 120 beats per minute),

tachycardia (more than 160 beats per minute), or foetal heart irregularity in all mothers who were diagnosed with MSAF.

Result

Table I: Incidence of Meconium Staining of Amniotic Fluid and Symptomatic Meconium Aspiration

Total no. of live births	**1775**
Meconium stained infants -total number	158
% of MSAF deliveries	*8.9%*
Symptomatic meconium aspiration- total number	25
% of symptomatic meconium aspiration	15.82%
Incidence in population (per 1000 live births)	14.08

This table show, out of total 1775 live births, meconium staining of amniotic fluid was documented in 158 infants (8.9%). Of these 158 infants only 25 developed symptomatic meconium aspiration (15.82%). Hence, the incidence of symptomatic meconium aspiration was 14.08 infants per 1000 live births.

Table II: Distribution of Meconium Stained Amniotic Fluid According To Maternal Age

Age in Years	**No. of Cases**	**Percentage**
16-20 Years	27	17.08
21-30 Years	95	60.13
31-4o Years	36	22.79
Total	158	100

This table depicts the maternal age in relation to meconium stained amniotic fluid. 16 to 20 yrs of age group shows 17.08 %, 21-30 years of age group shows 60.13 % and 31-40 yrs of age group shows 22.79 % respectively. Maximum number of meconium stained amniotic fluid seen in age group 21-30 years (60.13%)

Table III: Demographic Distribution of Meconium Stained Fluid

Distribution	**No. of MSAF**	**Percentage**
Rural	99	62.66%
Urban	51	32.28%
Tribal	8	5.06%
Total	158	100%

This table shows that rural population accounts for 62.66%. Urban population accounts for 32.28 % and tribal population 5.06% of the total cases. Hence, rural population accounts for maximum no. of cases.

Table IV: Gestational Age Distribution of Meconium Stained Infants

Gestation	**Non-Meconium Stained N=1617**	**Meconium Stained N=158**	**Total=1775**
<37 Weeks	166 (10.26%)V (92.22%)H	14(8.86%)V (7.77%)H	180
37 To 41 Weeks	1424(88.06%)V (91.45%)H	133(84.17%)V (8.54%)H	1557
>42 Weeks	27(1.66%)V (71.05%)H	11(6.97%)V (28.94%)H	38

P<0.05 (significant), V:- Vertical percentage, H:- Horizontal Percentage. This table shows that out of 1775 babies delivered, 180 babies were preterm, 1557 were term and 38 babies were post term and the incidence of meconium stain in preterm, term & post term is 7.77%, 8.54% & 28.94% respectively. The incidence of meconium stain in preterm, term and post term is 8.87%, 84.1% and 6.96% out of total 158 babies of MSAF respectively. The preterm babies with MSAF were mostly 35 & 36 weeks of Gestational age.

Table V: Birth Weight Distribution of Meconium Stained Infants

Birth Weight	**Non-Meconium Stained N=1617**	**Meconium Stained N=158**	**Total =1775**
<2.5kgs	426(26.34%)V (90.83%)H	43(27.21%)V (9.16%)H	469
2.5 - 3 Kgs	864(53.43%)V (91.91%)H(91.92%)H	76(48.1%)V (8.08%)H	940
3 - 4 Kgs	312(19.29%)V(89.91%)H(89.6%)!!	35(22.15%)V (10.08%)H	347
> 4 Kgs	15(0.92%)V (78.94%)H	04(2.54%)V (21.05%)H	19

P<0.01 (significant), V:- Vertical percentage, H:- Horizontal Percentage. Out of 158 meconium stained infants, 43 (27.21%) were < 2.5 kg, 76 (48.1%) infants weighed between 2.5 kg – 3 kg at birth, 35 (22.15%) were between 3 – 4 kgs & 4 (2.54%) were > 4kg at birth. The incidence of MSAF among the different birth weight group of <2.5 kg, 2.5-3 kg, 3-4 kg and more than 4 kg are 9.16%, 8.08%, 10.08% and 21.05% respectively.

Table VI: Weight for Gestation Distribution of Meconium Stained Infants

Category	Non-Meconium Stained N=1617	Meconium Stained N=158	Total=1775
AFD	1452(89.79%)V (91.89%)H	128(81.02%)V (8.10%)H	1580
SFD	134(8.28%)V (89.93%(H	15(9.49%)V (10.06%)H	149
LFD	31(1.917%)V (67.39%)H	15(9.49%)V (32.60%)H	46

P<0.01 (significant), V:- Vertical percentage, H:- Horizontal Percentage. 128 babies (81.02%) out of 158 meconium stained infants were appropriate for date (AFD), 9.49% of them were small for date (SFD) and 9.49% of them were large for date (LFD). 128 (8.10%) babies out of total 1580 AFD babies, 15 babies (10.06%) out of total 149 SFD babies & 15 (32.06%) babies out of total 46 LFD babies developed MSAF in our study.

Discussion

Amniotic fluid stained with meconium is a common occurrence. According to estimates, 8 to 29 percent of deliveries include it [1, 2, 3, 4,5]. Meconium Aspiration Syndrome (MAS), which is brought on by aspirating meconium, is a major contributor to prenatal morbidity and death [4,11,13, 14].

The goals of the current investigation were to ascertain the prevalence and range of meconium aspiration as well as to examine the epidemiological correlations of MAS and its consequences. Additionally, the value of a workable plan for managing such newborns was looked into.

The current study also showed that, whereas 81.02 percent of the newborns with meconium staining were suitable for date (AFD), 9.4 percent were small for date (SFD) and 9.4 percent were big for date (LFD). However, it was found that of the 46 LFD delivered during the study period, 15 (32.60%) had meconium staining, suggesting that LFD infants have a higher risk of MSAF. Additionally, the incidence of meconium staining in LFD infants was four times higher than in AFD infants, and it was also higher in SFD infants than in AFD infants.

Table VI shows a significantly significant (p<0.01) difference in the distribution of meconium stained newborns compared to normal infants. The current investigation also showed that children with meconium staining on the SFD (20%) had a somewhat higher chance of experiencing symptomatic MAS than did infants with meconium staining on the AFD (15.62%) (Table XI). Nonetheless, no statistically significant distinction was found between the group that was asymptomatic and the group that had symptoms. There is no information on this feature of MAS in the literature. The incidence of operative delivery was found to be significantly higher in meconium-stained cases compared to other high-risk deliveries due to active intervention by the obstetricians, as decided by them in accordance with their standard protocol. This difference was not statistically significant, but it was likely caused by foetal distress and prolonged MSAF, for which a Caesarian section was, performed (Table-VIII). Only 51.12% of the asymptomatic infants of MSAF were born vaginally, compared to 80% of the symptomatic MAS infants (including unaided and instrumental vaginal deliveries). 20% of cases with MAS with symptoms were delivered via caesarean section.

While no newborn delivered following polyhydramnious exhibited meconium staining, 10.13% of infants with meonium staining were linked to oligohydramnious. During the research period, 66 births of oligohydramnios occurred. Of these, 16 (24.24%) had MSAF, which was about three times higher than the frequency of MSAF in deliveries with normal amniotic fluid (8.34%).

Table VII shows that there was a significant (p<0.01) difference in the distribution of meconium stained and normal newborns across the three groups. Additionally, compared to babies delivered with a normal quantity of amniotic fluid, those born with decreased amniotic fluid had a 2.6 times higher chance of having symptomatic MAS, according to the current study. In their respective studies, Gupta, V. et al. (1996) and Chaturvedi, P. et al. (2OOO) also showed that MSAF & MAS are more prevalent in births with decreased amniotic fluid. [9,11].

Conclusion

The current study comes to the conclusion that obstetricians and paediatricians frequently deal with MSAF and symptomatic MAS. The most important risk factor for multiple systemic artery fibrillations (MSAF) is postmaturity.

Other obstetric risk factors, such as the presence of foetal distress, significantly increase the likelihood of MSAF. The thick meconiurn is more frequently

linked to symptomatic MAS, and oligohydramnious is strongly connected with MSAF.

For infants with MSAF, a selective strategy may be used, saving intratracheal suctioning for depressed or weak newborns. Once the oro-nasopharyngeal suctioning has been completed, the remaining newborns simply require close supervision. Additionally, perinatal death is frequently caused by deliveries with MSAF, which is strongly linked to birth asphyxia.

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