

## **Preventing Meconium Aspiration with a Combined Obstetrics–Pediatrics Approach**

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### **Abstract**

One of the main causes of respiratory distress in neonates, especially those born at term or post-term, is meconium aspiration syndrome (MAS). It happens when the newborn’s first feces, meconium, is aspirated into the lungs during pregnancy, obstructing the airway and causing inflammation and surfactant inactivation. A coordinated strategy between obstetrics and pediatrics is necessary to avoid MAS, with an emphasis on risk factor identification, suitable intrapartum care, and successful newborn resuscitation. This article summarizes the most important research and recommendations that have influenced contemporary practice while reviewing the available data on MAS prevention using combined obstetrics–pediatrics protocols. Along with the importance of obstetric interventions like reducing protracted pregnancies and the use of amnioinfusion, the evolution of preventative strategies—from routine

suctioning to targeted therapies based on neonatal vigor—is covered.

**Keywords:** Meconium aspiration syndrome, MAS, prevention, obstetrics, pediatrics, neonatal resuscitation, meconium-stained amniotic fluid

### **Introduction**

A newborn’s respiratory disease known as meconium aspiration syndrome (MAS) is brought on by the aspiration of meconium, the first feces, into the lungs before to, during, or right after birth. Hypoxia, respiratory distress, and possible long-term consequences including persistent pulmonary hypertension of the newborn (PPHN) are its defining features. With a prevalence of roughly 1-3 percent of all births, MAS mainly affects term and post-term newborns, while it may be more common in environments with inadequate prenatal care<sup>1-3</sup>. Significant morbidity and mortality are linked to the condition, especially in settings with inadequate resources<sup>4</sup>.

Respiratory failure and other problems may result from the pathophysiology of MAS, which includes airway obstruction, surfactant inactivation, and inflammatory responses<sup>4</sup>. The following are risk factors for MAS: post-term gestation, small for gestational age, oligohydramnios, cesarean section, thick meconium, irregular fetal heart rate, male newborn, maternal obesity, advanced maternal age, prior cesarean delivery, chorioamnionitis, and poor Apgar score<sup>10</sup>.

A multimodal strategy that incorporates pediatric and obstetric care is needed to prevent MAS. Aggressive suctioning was the norm in the past, but new research suggests a more cautious strategy that emphasizes the baby's vitality at birth<sup>6</sup>.

### **Materials and Methods**

Using PubMed, Google Scholar, and other pertinent databases, a literature search was carried out using keywords such "meconium aspiration syndrome," "prevention," "combined obstetrics pediatrics protocol," "meconium-stained amniotic fluid," and "neonatal resuscitation." Included were studies published between 1976 and 2024 that focused on randomized controlled trials, systematic reviews, meta-analyses, and recommendations from prominent medical associations like the American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG). Studies addressing MAS prevention, in particular those incorporating coordinated obstetric and pediatric interventions, were included in the inclusion criteria. To guarantee dependability, only peer-reviewed papers from respectable publications were taken into account.

### **Results & Discussion**

#### **Historical perspectives and key studies**

Aggressive airway control was a key component of early MAS preventive strategies. A combined obstetric and

pediatric method was first presented in a landmark study by Carson et al. (1976), which involved three normal intrapartum pharyngeal suctioning procedures using a DeLee catheter for newborns with meconium-stained amniotic fluid (MSAF). With no documented negative aftereffects, this strategy dramatically decreased the prevalence and severity of MAS<sup>1</sup>. In a similar vein, Singh et al. (1996) conducted a comparative study that assessed results in two neonatal units and showed that prompt combined obstetric (such as cesarean section) and pediatric (such as laryngoscopy, tracheal in the intervention group.

#### **Evolution of protocol**

The strategy for preventing MAS has changed dramatically throughout time. Once commonplace, routine intrapartum upper-airway suctioning is no longer advised since there is no data to support its effectiveness in active neonates<sup>3;4</sup>. Guidelines have changed as a result of studies like Vain et al. (2004) that demonstrated no difference in the incidence of MAS with or without intrapartum suctioning<sup>11</sup>. MAS-diagnosed term newborns who are admitted nonetheless constitute a high-risk group with substantial morbidity and frequently need expensive treatments<sup>13</sup>.

Additional revisions in 2015 focused on efficient breathing and oxygenation, doing away with routine intubation and tracheal suctioning for nonvigorous newborns. In non-vigorous newborns, endotracheal suctioning did not significantly lower the incidence of MAS or the morbidities that go along with it. In particular, there was no discernible improvement in the severity of MAS, the length and intensity of shock, the requirement for and duration of mechanical ventilation, subsequent pneumonia or sepsis, or neurodevelopmental outcomes at 9 months of age. These results are consistent with earlier research indicating that routine endotracheal

suctioning might not be particularly beneficial for non-vigorous neonates<sup>14</sup>. The results of Al Takroni et al.'s (1998) randomized controlled trial, which assessed nasopharyngeal suctioning in full-term infants delivered via meconium-stained amniotic fluid (MSAF), showed that routine nasopharyngeal suctioning did not significantly lower the incidence of MAS. Al Takroni et al.

### Current guidelines

The American College of Obstetricians and Gynecologists (ACOG) and the NRP provide clear guidelines for managing newborns with MSAF. For vigorous infants (good respiratory effort and muscle tone), no intubation or suctioning is required, and initial care can be provided with the mother. For nonvigorous infants, resuscitation under a radiant warmer is recommended, with intubation and suctioning only if the airway is obstructed<sup>6</sup>. These guidelines reflect a shift toward minimizing unnecessary interventions while ensuring effective resuscitation for those in need.

### Obstetrics intervention

In order to avoid MAS, obstetric measures are essential. One important factor in lowering the frequency of MSAF and MAS has been found to be the curtailment of

Table 1: Risk Factors for Meconium Aspiration Syndrome<sup>10</sup>

Category	Risk Factor	Pooled OR (95% CI)	P-value
Maternal	Obesity (BMI $\geq 30$ kg/m <sup>2</sup> )	2.27 (1.53–3.35)	<0.001
	Advanced maternal age (>34 yrs)	1.46 (1.15–1.85)	0.002
Peripartum	Previous cesarean delivery	1.27 (1.08–1.50)	0.004
	Chorioamnionitis	1.83 (1.18–2.84)	0.007
	Oligohydramnios	2.35 (1.09–5.08)	0.03
Fetal-Neonatal	Cesarean section	2.50 (1.68–3.73)	<0.001
	Thick meconium	3.96 (2.02–7.77)	<0.001
	Abnormal fetal heart rate	4.70 (3.50–6.32)	<0.001

protracted pregnancy (beyond 41 weeks)<sup>7</sup>. According to a research by Yudkin et al. (1987), proactive management of post-term pregnancies significantly reduces MAS<sup>18</sup>.

Numerous studies have been conducted on amnioinfusion, which involves infusing saline to dilute meconium in MSAF, with varying degrees of success. Amnioinfusion decreased MAS in 26 1 situations with poor peripartum surveillance, according to Fraser et al. (2005); however, its effectiveness in well-monitored settings has not been established<sup>8: 9</sup>. On the other hand, uterine stimulants like misoprostol and procedures like amniotomy may raise the chance of MAS and MSAF<sup>7</sup>

### Risk Elements

Several risk variables for MAS were found by Luo et al. (2023) in a meta-analysis, which is compiled in 30 2 Table 1. These elements emphasize how crucial prenatal and postpartum monitoring are in identifying pregnancies that are at risk.

Category	Risk Factor	Pooled OR (95% CI)	P-value
	Post-term gestation	4.03 (2.84–5.71)	<0.001
	Apgar <7 at 5 min	14.89 (9.52–23.28)	<0.001

### Discussion

A multimodal strategy that incorporates pediatric and obstetric care is needed to prevent MAS. According to Carson et al. (1976), vigorous suctioning was common in the past.

It showed that regular pharyngeal suctioning significantly decreased the occurrence of MAS<sup>1</sup>. The effectiveness of routine suctioning in vigorous babies was questioned by later research, including Vain et al. (2004) and Wiswell et al. (2000), which caused a paradigm shift toward targeted interventions<sup>11; 12</sup>. The current ACOG and NRP guidelines place a strong emphasis on determining the neonatal's level of vitality and administering focused resuscitation while avoiding needless, perhaps harmful treatments<sup>6</sup>.

In order to avoid MAS, obstetric measures are essential. It has been demonstrated that reducing the number of extended pregnancies by promptly inducing labor lowers the frequency of MSAF and MAS<sup>7; 18</sup>. The use of uterine stimulants like misoprostol and procedures like amniotomy, however, may raise the risk of MSAF, underscoring the necessity of carefully evaluating obstetric practices<sup>7</sup>. Amnioinfusion is still debatable; data only points to benefits in 28 situations with scant monitoring<sup>8; 9</sup>. These results highlight how crucial it is to modify treatments according to the clinical context and the resources at hand. For infants with meconium-stained AF, a selective approach to tracheal intubation and suction was not linked to higher pulmonary morbidity or mortality. Adverse pulmonary outcomes are not always prevented by postnatal care of newborns who are most at risk of meconium aspiration syndrome<sup>16</sup>. Assessing the

new born's condition and administering the proper resuscitation are the main priorities in the delivery room. There is no need for any special care beyond that required for newborns that are active. Providing enough breathing and maintaining a clean airway are critical for nonvigorous newborns<sup>6</sup>. Research has demonstrated that MAS outcomes are influenced by the quality of resuscitation performed in the delivery room, with studies showing that well-coordinated resuscitation<sup>31</sup> lowers complications<sup>17</sup>. Despite advances, areas of controversy remain. The role of amnioinfusion in well-monitored settings requires further investigation, as does the potential use of antenatal corticosteroids or other preventive strategies. Additionally, the high variability in MAS incidence and outcomes across different settings suggests a need for standardized protocols and improved training for healthcare providers.

### Conclusion

Combined obstetrics–pediatrics protocols are essential for the prevention of meconium aspiration syndrome. Adhering to current evidence-based, the incidence and severity of MAS can be considerably decreased by following recommendations and coordinating care between pediatricians and obstetricians. Managing lengthy pregnancies, selective suctioning according to newborn vigor, and making sure nonvigorous neonates receive appropriate resuscitation are important tactics. To significantly improve outcomes for neonates at risk of MAS, ongoing research and ongoing training of healthcare professionals are essential.

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