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RISK FACTORS FOR MECONIUM STAINED AMNIOTIC FLUID AND ITS IMPLICATIONS

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Abstract: **Objectives; The aim of the study was to identify the risk factors for MSAF and compare its outcome with clean amniotic fluid.**

Methods: A case control study was done in a Teaching Hospital Batticaloa, Sri Lanka over a period of two months in 2019.Seventy-five pregnant mothers with meconium stained amniotic fluid and Seventy-five pregnant mothers with clear amniotic fluid, were enrolled in the study group.

Results; Majority of the study participants represented the 18 to 30 years age group (N=119:79.3%). A contributory association is observed Between induction of labour and child birth associated with meconium stained amniotic fluid (OR=2.05). Significantly higher number of babies with fatal distress were delivered by mothers identified with meconium stained amniotic fluid and significantly higher number of NICU admissions among them. It was possible to observe significantly higher number of normal deliveries among participants with meconium stained amniotic fluid and significantly higher number of child births occurred through LSCS were observed with meconium stained amniotic fluid.

Conclusion; Meconium stained amniotic fluid in labour is associated with fetal distress, surgical intervention of child birth and NICU admission following delivery.

Keywords: **Meconium, Amniotic fluid, Child birth.**

1. INTRODUCTION

Meconium is a term derived from the Greek mekoni, meaning poppy juice or opium. It is the foetal intestinal content and can be found after 10 to 16 weeks of gestational age. It is dark greenish in colour, sterile and thick in consistency (1,2).

Its constituents are 75% water, the remaining 25% consists of gastric secretions, bile salts, mucous secretion, vernix caseosa, lanugo hair, blood, pancreatic enzymes, free fatty acids, chemical substances like lipids, carbohydrates, nitrogen, electrolytes and squamous cells(3).

A newborn usually passes meconium within the first 24 to 48 hours after birth. However, if baby passes meconium either before its birth, it gives meconium staining of amniotic fluid (MSAF), occurs in approximately 12 percent of all deliveries. The passage of meconium in utero occurs primarily in situations of advanced fetal maturity or fetal stress. Most infants who are delivered with meconium-stained amniotic fluid are 37 weeks of gestation or older; meconium rarely appears in amniotic fluid before 32 weeks of gestation. The exact pathological explanation for MSAF is not well studied but it is believed that fetus pass meconium from the fetal colon in response to hypoxia and may stimulate fetal gasping movements that result in meconium aspiration and that meconium therefore signals fetal compromise(4). It can also be due to several other reasons such as mesenteric vasoconstriction induced gut hyperperistalsis, falling umbilical venous saturation and vagal stimulation (4,5).

If the meconium diffuses or aspirated in to the lower airways, the fetus develops meconium aspiration syndrome, occurs in 5 percent of these infants. Of infants in whom the meconium aspiration syndrome develops, more than 4 percent die (6).

The severity of respiratory symptoms and signs, morbidity and mortality is directly related to the amount and thickness of meconium aspirated (7–10).

The clinical features of meconium aspiration syndrome of newborn are respiratory compromise such as tachypnea, cyanosis and reduced pulmonary compliance. Persistent pulmonary hypertension due to increased pulmonary vascular resistance may accompany the meconium aspiration syndrome; there is an increased prevalence of asthmatic symptoms and abnormal bronchial reactivity among survivors of the syndrome [11,12]

The respiratory compromise can also occur due to mechanical blockage when aspirated meconium particles obstruct the small airways. Meconium can also induce chemical pneumonitis on lung alveoli, causes inhibition of pulmonary surfactant function and inflammation contribute further to small-airway obstruction. Acute intrapulmonary meconium contamination induces a concentration-dependent pulmonary hypertensive response with 15 to 20 percent of infants with the meconium aspiration syndrome demonstrating persistent pulmonary hypertension [13,14].

Chronic hypoxemia resulting from meconium aspiration, induces a long-term process of muscularization of distal pulmonary arterioles. It could contribute to the pulmonary symptoms. Meconium could also constrict umbilical vessels leads to its necrosis and the production of thrombi. The clinical relevance of these phenomena is uncertain [15].

Aspiration pneumonia is commonly seen on right side than left side as the right main bronchus is shorter, straighter, wider and it is more in line with trachea [16,17]. The outcome of MAS primarily depends on type, amount of meconium aspirated, and perinatal care offered to the baby during delivery. Proper perinatal care, planned team approach to Meconium Stained Amniotic Fluid babies has changed the morbidity and mortality of MAS [18]. Several maternal and fetal risk factors were identified for MSAF [19].

2. MATERIALS AND METHODS

This is a case control study done in Teaching hospital Batticaloa over a period of two months from May 2019-July2019.

The singleton pregnancies with cephalic presentation at term gestation in the absence of major congenital anomalies were selected for the study group. The study groups were divided into two groups, based on the colour of the amniotic fluid detected at any time of labour. Those were meconium stained amniotic fluid (MSAF) group and clear amniotic fluid (CAF) group. In MSAF group, 75 mothers were selected. The next woman giving birth following the index pregnant mother who satisfied the same inclusion criteria were selected for control group of clear amniotic fluid. Data was collected on a standardized questionnaire.

Maternal antenatal factors, intrapartum factors and the neonatal outcome were obtained. Standard definitions were followed. Neonatal parameters compared between the above mentioned two groups. Further maternal parameters compared were mode of delivery such as vaginal, instrumental or cesarean delivery.

Frequencies and percentages are used to describe categorical variables. Odds Ratio was applied to determine the associations on selected factors. 95% confidence interval and the 0.05 probability cut off were applied to determine statistical significance. Data analysis was facilitated by statistical package for social sciences version 24.0

3. RESULTS

Majority of the study participants represented the 18 to 30 years age group(N=119:79.3%). Majority were primi gravidae mothers (N=89:59.3%) and majority had participated their antenatal booking visit(N=125:83.3%) within the first twelve weeks of pregnancy. Majority of the study participants had completed their full term at the time of delivery (N=139:92.6%). Considerable number of study participants had participated 5-10 antenatal visits(N=98:65.3%) (Table1).

Majority of the study participants identified with pre-existing Hypertension or Diabetes Mellitus and majority of the study participants with Pregnancy Induced Hypertension (PIH), underwent deliveries with meconium stained amniotic fluid. (Table-2) All the mothers who were identified of having Premature Rupture of Membranes and Gestational diabetes Mellitus had meconium stained amniotic fluid. (Table 2). A contributory association is observed Between induction of labour and child birth associated with meconium stained amniotic fluid (OR=2.05). During this, more than induction by foley catheter, induction by using prostaglandins was associated with meconium stained amniotic fluid at the time of

delivery. Induction by using oxytocin was significantly associated with meconium stained amniotic fluid at the time of delivery. (Table 3)

When perinatal outcome was considered, it was noted that significantly higher number of babies with fatal distress were delivered by mothers identified with meconium stained amniotic fluid. (Table 4) Also it was possible to observe significantly higher number of NICU admissions among them. It was possible to observe significantly higher number of normal deliveries among participants with meconium stained amniotic fluid and significantly higher number of child births occurred through LSCS were observed with meconium stained amniotic fluid. (Table 5).

Table 1: Distribution of pregnancy associated characteristics among participants

Characteristic		Amniotic Fluid Colour		Total N (%)
		Meconium N (%)	Clear N (%)	
Age				
	<18	2(66.6)	1(33.3)	3(100.0)
	18-30	57(47.8)	62(52.1)	119(100.0)
	>30	16(57.1)	12(42.8)	28(100.0)
Gravidity				
	Primi-gravida	30(33.7)	59(66.3)	89(100.0)
	Multi-gravida	45(73.7)	16(26.2)	61(100.0)
Time of Booking visit				
	<12 weeks	57(45.6)	68(54.4)	125(100.0)
	12-24 weeks	17(73.9)	6(26.1)	23(100.0)
	>24 weeks	1(50.0)	1(50.0)	2(100.0)
Gestational Age at Delivery				
	Pre term	5(45.5)	6(54.5)	11(100.0)
	Term	70(50.4)	69(49.6)	139(100.0)
Total Antenatal Visit				
	<5	4(66.6)	2(33.3)	6(100.0)
	05-10	60(61.2)	38(38.7)	98(100.0)
	>10	11(23.9)	35(76.1)	46(100.0)
Total		**75**	**75**	**150**

Table 2: Distribution of pathophysiological characteristics associated with antepartum period

Characteristic	Amniotic Fluid Colour		Total(N%)
	Meconium N (%)	Clear N (%)	
PIH	8(72.7)	3(27.3)	11(100.0)
Pre-existing HT	8(57.1)	6(42.9)	14(100.0)
GDM	2(100.0)	0(0.0)	2(100.0)
Pre-existing DM	3(60.0)	2(40.0)	5(100.0)
Pre-eclampsia	0(0.0)	1(100.0)	1(100.0)
IUGR	4(50.0)	4(50.0)	8(100.0)
Anemia	3(60.0)	2(40.0)	5(100.0)
Oligohydramnios	4(44.4)	5(55.6)	9(100.0)
PROM	1(100.0)	0(0.0)	1(100.0)
Others	2	0	2(100.0)

Table 3: Association of management intervention of antepartum period among study participants

	Amniotic Fluid Colour		OR	95%CI
	Meconium	Clear		
Onset of Labour				
IOL	14	24	2.05	0.96-4.37
SOL	61	51		
Cervical Ripening Method				
Intervention	21	14	1.32	0.62-2.87
None	61	54		
Induction type				
Foley Catheter	2	7	0.02	0.01-0.63
Prostaglandin	19	7		
Usage of Oxytocin				
Yes	31	16	2.59	1.26-5.33
No	44	59		

Table 4: Distribution of perinatal outcomes

	Amniotic Fluid Colour		Z	P value
	Meconium	Clear		
Foetal Distress	**23**	**3**	**5.5**	**<0.001**
Low Birth Weight	**9**	**10**	**0.4**	**0.71**
Still Birth	**1**	**0**	**-**	**-**
NICU Admission	**19**	**2**	**5.3**	**<0.001**

Table 5: Distribution of modes of delivery among study participants

	Amniotic Fluid Colour		Z	P value
	Meconium	Clear		
NVD	**26**	**62**	**5.6**	**<0.001**
Forceps	**2**	**1**	**-**	**-**
Vacuum	**3**	**3**	**-**	**-**
LSCS	**40**	**9**	**6.1**	**<0.001**

4. DISCUSSION

As described by Munda et al, Deshani et al, and Kahatuduwa et al, significant risk associations are demonstrated by PIH and Pre-eclampsia with MSAF. This situation is confirmed by the current study findings as well. But during the current study it was possible to observe that deliveries with meconium stained amniotic fluid were recorded in higher numbers among participants with pregnancy induced hypertension and pre-existing hypertension. There was only one patient diagnosed of having Pre-eclampsia and her delivery was recorded with clear amniotic fluid.

According to Shriner et al, occurrence of fetal heart rate abnormalities during the second stage of Labourer and need of admitting to NICU due to many reasons are associated with MSAF during Labour. Birth asphyxia also acts as a causative factor for this condition and current study findings also confirms these facts.

According to Justine and Hofmer, Oxytocin is an inefficient induction agent and application of vaginal prostaglandins is more safe and effective method. But according to the current study findings, it is observed that both oxytocin and prostaglandin application methods are associated with MSAF during delivery. However, it was not possible to assess the collective efficiency of induction methods during the current study. Therefore, it is difficult to describe any causality association between MSAF with other factors.

More ever, association between MSAF and fetal distress was confirmed during this study and as well as during numerous studies conducted at many study settings all around the world. Presence of MSAF was frequently observed among Deliveries done through LSCS and according to the findings of the current study.

Higher incidence of MSAF were observed with increased age of the mother and teenage pregnancies. Nareen et al had distinctly identified that presence of MSAF is associated with maternal age above 30 years. However, Sundaram et al had noted that presence of MSAF does not associate with maternal age. This finding should be addressed with more attention because, present study findings demonstrate that multigravida situation also associates with presence of MSAF.

Not attending the booking visit during the first trimester and reduction of total number of antenatal clinic visits are also associated with presence of MSAF. There are for it is possible to assume that less attention regarding antenatal clinics leads to presence of MSAF at birth. Therefore, presence of MSAF appears to be a multifactorial condition beyond a direct obstetric event with extended studies.

5. CONCLUSION

Meconium stained amniotic fluid in Labour is associated with fetal distress, surgical intervention of child birth and NICU admission following delivery. It is possible to identify risk associations for meconium stained amniotic fluid among Labour induction methods and antenatal morbidities. Therefore, it is more appropriate to apply preventive measures accordingly.

Conflict of interest; None

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