

Correlation of umbilical blood pH and outcome in meconium stained deliveries



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ABSTRACT

Background: Umbilical cord blood analysis is assumed to give a picture of acid base balance of the infant at the moment of birth when umbilical circulation is arrested by clamping of the cord. Meconium stained deliveries often cause anxiety in the minds of clinicians attending such newborn. **Aims and Objectives:** To study the correlation of umbilical cord pH with apgar and outcome and predict a model to help us to detect cases of meconium that need active monitoring and intervention. **Materials and Methods:** This was a prospective observational study. 86 newborn born to mothers with meconium at artificial rupture of membranes was enrolled for the study. All newborn had arterial blood gas analysis from umbilical cord. **Results:** The pH of umbilical blood showed positive correlation with apgar scores at 1minute ($r=0.46$) and negative correlation with thick meconium ($r=-0.35$) and outcome ($r=0.36$). **Conclusion:** The correlation though not strong are suggestive of the fact that meconium deliveries with poor apgar and thick meconium should be monitored before discharge.

Key words: Apgar, Meconium, Newborn, Cord blood pH

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INTRODUCTION

Meconium stained liquor complicated 8.4% of all livebirths.¹ Over the years the incidence of MAS has declined. Since presence of meconium is associated with fetal asphyxia, it is always a cause of anxiety to the clinician attending such deliveries. Though the umbilical cord blood gas analysis is now recommended in all high risk deliveries by both the British and American College of Obstetrics and Gynaecologist² it is a far reaching solution in developing countries. All meconium deliveries do not need NICU admission but it is difficult to isolate those cases that will have complications. Hence in our hospital we tried to conduct arterial blood gas in meconium deliveries and see the correlation with apgar and outcome and predict a model to help us to detect cases of meconium that need active monitoring and intervention.

MATERIALS AND METHODS

This was a prospective observational study carried out in the department of Gynaecology and Obstetrics and

NICU at ESIC PGISMR & MC, Joka, Kolkata. The study period extended from January 2014 to June 2015. 86 newborns born to mothers with singleton pregnancy between 37 and 41 weeks in spontaneous or induced labour with meconium were enrolled for the study. Exclusion criteria included multiple pregnancies, infection and major congenital anomalies. We excluded all mothers who had chronic causes of hypoxia like anaemia, pregnancy induced hypertension, gestational diabetes, antepartum haemorrhage and heart disease that lead to meconium.³ Resuscitation was done based on neonatal resuscitation program (NRP). The blood was collected from the cord attached to the baby after releasing the clamp in a heparinised syringe and fed into the gas analyzer (Nova Biomedicals, USA). Data of demographic variables was collected from case records.

The ethical clearance was taken from institutional ethical committee. Informed consent was taken from the mothers in cases of deliveries where meconium was noted at artificial rupture of membrane. The sample size was calculated considering $d=0.3$, with 90% power and 95% confidence interval at 86 for a two tailed hypothesis. Data

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was analyzed using correlation and regression on excel spreadsheet using XL Miner analysis.

RESULTS

The distribution of demographic variables is shown in Table 1. Caesarean section was predominant. There was thick meconium in 47.7% cases. The apgar at 1 minute was <7 in 9.8% cases. The mean pH was 7.29 ± 0.06 and the pH was <7.2 in 22.1% cases. The outcome however was poor in 5.8% of which meconium aspiration syndrome occurred in 4.7% and hypoxic ischaemic encephalopathy in 1.2% cases.

In Table 2, there is significant positive correlation (Figure 1) of pH with apgar scores at 1 minute ($r=0.45$) and negative correlation with meconium ($r=-0.30$). The outcome is positively correlated with meconium ($r=0.26$) and

negatively associated with pH ($r=-0.31$). Since meconium is coded as thin (0) and thick (1) presence of thick meconium is associated with fall in pH and poor outcome (1).

In Table 3, the regression analysis model shows that there is significant association of outcome with pH, apgar and meconium. The model for pH shows 30% variance in outcome. This is similar to the variance in outcome with apgar and meconium taken together as independent variable. In this model the association with apgar was not significant due to multicollinearity. The correlation of apgar with outcome however has the least goodness of fit.

DISCUSSION

There is an association between meconium stained deliveries and adverse perinatal outcome. The apgar score was <7 in 12.9% cases which is lower than previous studies of 17.3%⁴ as all chronic causes of hypoxia leading to meconium have been excluded. Our report however differ from a Turkish⁵ report that found a similar rate of MAS among MSAF but they had 69% of the newborn with apgar <7. We report 4.7% MAS similar to a review of ten reports showing a combined incidence of 4.2% of MAS among MSAF.⁶ We also noted that all complications developed within 24 hours of delivery. The apgar at 1 min showed significant positive correlation with umbilical cord pH in

Table 1: Distribution of demographic variables, apgar, pH and outcome

Variables	n=86 (%)
Gestational age wks	38.98±1.09
Weight gm	2.73±0.37
Sex	
Female	37 (43.02)
Male	49 (56.97)
Maternal age	24.56±4.25
PrimiGravida	56 (65.12)
Caesarean	36 (41.86)
pH <7.25	19 (22.1)
Apgar at 1 minute <7	9 (9.8)
Poor outcome	5 (5.8)
MAS	4 (4.7)
Hypoxic encephalopathy	1 (1.2)

Table 2: Correlation between apgar, pH, meconium and outcome

	A1	Meconium	pH	Outcome
A1	1			
Meconium	-0.22908	1		
pH	0.445684	-0.298891	1	
Outcome	-0.20393	0.2602896	-0.30674	1

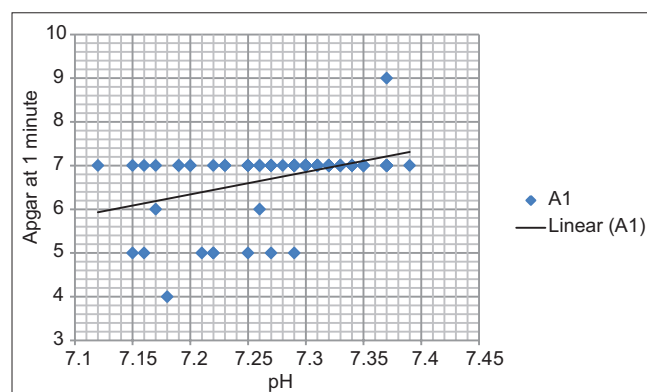


Figure 1: Scatter plot with regression line for pH with apgar score at 1 minute ($r=0.4$, $p=0$)

Table 3: Regression model for outcome

Model	Independent variable	Coefficient	Standard error	t	p	r	r ²
1	Constant	8.57	2.88	2.97	0.003	0.30	0.09
	pH	-1.16	0.39	-2.95	0.004		
2	Constant	0.52	0.24	2.14	0.04	0.20	0.04
	Apgar	-0.07	0.04	-1.90	0.06		
3	Constant	0.00	0.03	3.66	1	0.20	0.07
	Meconium	0.12	0.05	2.47	0.02		
4	Constant	0.35	0.25	1.40	0.16	0.30	0.09
	Apgar	-0.05	0.04	-1.42	0.19		
	Meconium	0.11	0.05	2.09	0.005		

meconium deliveries which however has been previously reported in healthy newborn.⁷

Ierland et al's⁸ suggestion that vigorous infants born through MSAF with a 5-minute Apgar score of 9 or 10 can be safely discharged from the hospital without 24-hour postnatal clinical observation needs further consideration as apgar and outcome did not show strong association in regression model.

CONCLUSION

Meconium stained aspiration syndrome in meconium stained amniotic fluid deliveries are on the decline. Umbilical cord blood pH shows significant correlation with apgar.

Apgar score with meconium does correlate with outcome and can help to predict outcome similar to umbilical pH. Hence deliveries with thick meconium and poor apgars need observation for at least 48 hrs before discharge.

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Authors Contribution:

SM - Concept and design of the study, statistical analysis and its interpretation, manuscript preparation and revision; **SS** - Review of literature, collection of data and statistical analysis and first draft of manuscript; **NKD** - Concept, data collection and review of study

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