



**"PROSPECTIVE STUDY OF CORRELATION BETWEEN CORD BLOOD PH LEVEL AND FETAL OUTCOME AT BIRTH "**

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**ABSTRACT**

To explore the diagnostic specificity and clinical application of neonatal umbilical cord blood gas pH analysis in the prognosis of fetal distress, and to provide theoretical basis for neonatal rescue. Clinical data of a total of 450 singleton pregnant women and their neonates who delivered in the Obstetrics Department of our hospital from September 2021 to October 2022 were Prospectively analyzed. The mean pH value among patients with acidemia was 7.25±0.13 and in those without acidemia was 7.25±0.05. 100% of the neonates with HIE Grade 2 and 92.90% with HIE Grade 3 developed acidemia. Among those with meconium aspiration syndrome, all (100%) developed acidemia. In the study population, 48 neonates out of 450 neonates required resuscitation. Majority were neonates with acidemia who required either ICU admission (97.20%), ventilator support (97.20%) or resuscitation (95.80%). Among those neonates who were certified, majority (98.20%) presented with acidemia. Among neonates who did not have acidemia, 99.50% were discharged healthy. Cord blood gas analysis can help to improve the accuracy of fetal distress diagnosis. Cord blood gas is closely related to neonatal prognosis

**KEYWORDS :** Acidosis , Hypoxia , Fetal distress , perinatal prognosis.

**INTRODUCTION**

"The moment a child is born, the mother is also born. She never existed before. The woman existed, but the mother, never." Finding ways to predict a poor neonatal outcome in babies at high risk has drawn a lot of attention lately. One such test is umbilical cord arterial blood Ph analysis.

Fetal distress is a syndrome of fetal hypoxia and/or acidosis in the womb, and one of the main causes of neonatal respiratory distress syndrome, perinatal death and long-term disability. It is often caused by the obstruction of blood oxygen transfer and exchange between mother and fetus due to low maternal blood oxygen concentration, abnormal fetal factors or degenerative changes such as in the placenta.

Therefore, when monitoring the status of newborns in clinic, most measure the umbilical arterial blood gas analysis value, so as to directly reflect the acid-base status, gas and material metabolism of newborns. The interpretation of umbilical cord blood gas analysis results can preliminarily determine the acidbase situation in blood by measuring the H<sup>+</sup> concentration in blood gas samples.

It is also recognized internationally that taking umbilical cord blood for blood gas Ph analysis and detection after birth is a quantitative analysis method of fetal perinatal stress, which reflects the acid base balance of newborns in the form of objective indicators, with strong specificity.

The main factor in determining brain injury is the pH of the umbilical artery, which defines asphyxia. The likelihood of brain damage is low even at the most severe level of acidosis, which is generally accepted as pH less than 7.0. However, many newborns with cord pH values under 7.00 are clinically healthy and show no signs of short-term morbidity

Some studies have shown that if the time from the discovery of fetal distress to timely delivery is within 2 hours, only 15.65% of newborns will experience neonatal asphyxia. For those who deliver within 2 to 6 hours, the neonatal asphyxia rate reaches 29.63%.

For those who are treated for more than 10 hours, neonatal asphyxia can reach 42.86%, and intrauterine distress will also

increase the incidence of neonatal acidosis due to prolonged hypoxia, resulting in a poor prognosis. In recent years, the clinical application value of neonatal umbilical arterial blood gas analysis has gradually attracted the attention of the perinatal medical community. The results obtained are objective.

**METHODS:**

Inclusion criteria include ,All low risk & High risk singleton term(>37 weeks) pregnancies in labour including those who were diagnosed with Eclampsia and preeclampsia, complicated pregnancies like cord prolapse, chorio amnionitis, abruption, cord compression etc and the Exclusion criteria include, Multiple pregnancies ,Premature newborns where Apgar was found <7 at 1 min after birth, Meconium in Breech presentation. Intrapartum fetal and maternal monitoring will be done as per institutional protocols and mode of delivery decided.

This study was approved by the medical ethics committee of the hospital, and all pregnant women were informed and signed the informed consent.

After birth, the assistant puncture the umbilical artery for umbilical blood gas pH analysis and 0.5-1 ml of cord blood was collected from umbilical artery in pre-heparinized syringe which is sent to laboratory within 30 minutes for Arterial blood pH analysis.

**Statistical analysis**

Statistical analysis was done using SPSS (SPSS Inc, ver. 27 Chicago) software package for data entry and analysis In all the above test the "p" value of less than 0.05 was accepted as indicating statistical significance. Data analysis was carried out using Statistical package for Social Science (SPSS, V 27) package.

**RESULTS**

**1-Association of Cord blood pH With Acidemia In Newborn Babies.**

Cord blood	Acidemia				P-VALUE
	Yes (N=56)		NO (N=394)		
	Mean	SD	Mean	SD	
pH(<7.18)	7	0.13	7.25	0.05	0.000 Significant

**2- Paediatric Diagnosis of neonate based on acidemia in study cases.**

Paediatric diagnosis	Acidemia				P-VALUE
	Yes (N=56)		NO (N=394)		
	Count	Row N %	Count	Row N %	
Meconium aspiration syndrome	28	50.00%	0	0.00%	<0.05 Significant
HIE grade 3	13	23.21%	1	7.10%	
HIE grade 2	12	21.40%	0	0.00%	
No diagnosis	3	5.35%	393	99.20%	
Total	56	12.44%	394	87.56%	

**3- Final neonate outcome in study.**

Final (Neonate) outcome	Acidemia(Ph=<7.18)				P-VALUE
	Yes (N=56)		NO (N=394)		
	Count	Row N %	Count	Row N %	
Certified	54	98.20%	1	1.80%	<0.05 Significant
Healthy	2	0.50%	393	99.50%	

**DISCUSSION**

The PH value in the umbilical artery blood gas analysis of the newborn can most simply and clearly reflect the acid-base condition in the body. In addition, it can also reflect the hypoxia and hypercapnia of the fetus. pH of range 7.18-7.38 is considered normal and pH below 7.18 is considered Acidemia.

In our study we found that mean pH value among patients with acidemia was 7±0.13 and 7.25±0.05 in neonate without acidemia. James et al. reported in 1958 that gas analysis of blood samples obtained from clamped umbilical cord could reflect fetal hypoxia. A Cord Ph less than 7, when combined with other abnormal clinical findings, strongly correlates with adverse neonatal outcomes.

Out of 450 cases 56 neonate (12.4%) develop acidemia, irrespective of mode of delivery. Among 56 cases 28 newborn (50%) had MAS, 13 cases (23.21%) had HIE grade 3 and 12 newborn has HIE grade 2. Rest 3 cases (5.35%) with no specific diagnosis develop Acidemia. Sabol BA and Caughey AB (1) stated that even in neonates born with a reassuring clinical status, acidemia can still occur and that neonates with acidemia are at a significantly higher risk of having RDS, MAS, and admission to the NICU. These risks were further increased with the severity of acidemia.

Out of total, 56 cases neonate develop Acidemia. 54 neonate (98.20%) did not survive. 2 neonates (0.50%) were admitted in NICU for few days and discharged after complete recovery.

In the study done by Mousa Ahmadpour (18) the outcome of 120 high risk neonates were observed. 42 neonates among 60 belonging to group of neonates with pH less than 7.2 needed resuscitation against 13 in the other group with pH more than 7.2. They concluded that pH of 7.2 can be taken as a cut off for determining the prognosis of short term outcome in neonates.

Majority were neonates with acidemia who required either ICU admission (97.20%), ventilator support (97.20%) or resuscitation (95.80%). Ahmadpour Mousa et al (18) which looked into factors determining the neonatal outcomes. 16 babies with pH less than 7.2 required NICU admission against 3 babies in the other group with pH more than 7.2. The difference was reported to be statistically significant. Victory et al found that the risk for NICU admission progresses with worsening of acidemia at birth in term neonates. In a study by Rogers et al (19), it was found that among those with pH >7.02, only 50% needed resuscitation and 36.36% of babies needed

NICU admission, while all required resuscitation and NICU admission, when the pH was between 6.80 and 7.02.

In our study, among those neonates who were certified, 54 neonates (98.20%) presented with acidemia. 2 neonates were admitted in NICU for few days and discharged after complete recovery.

Shah PS et al [35] studied a total of 1040 and 1217 neonates had analyzable umbilical cord arterial and venous blood gas values, respectively. In the cohort, the mean (standard deviation) gestational age was 26.5 (1.5) weeks, the mean birthweight was 936 (215) g, the prevalence of mortality was 10% (105/1040), and the prevalence of severe neurologic injury was 9% (92/1016). An umbilical cord arterial pH of ≤7.1 and base excess of ≤ -12 mmol/L were associated with >2.5-fold higher post test probability of mortality, and an umbilical cord arterial or venous lactate value of <3 was associated with a 2.5-fold lower post test probability of mortality. An umbilical cord arterial lactate value of <3 was associated with a lower post test probability of severe neurological injury. The limitation of this study is that the long-term prognosis of neonates with asphyxia was not tracked over time, so it was not possible to analyze the long-term prognosis of neonates with asphyxia.

**CONCLUSIONS**

Umbilical cord blood pH analysis is helpful to improve the accuracy of fetal distress diagnosis, and umbilical cord blood gas is closely related to neonatal prognosis. Compared with acute fetal distress, chronic fetal distress is more likely to lead to neonatal acidosis and asphyxia.

Although the current study showed particular infant complications linked to aberrant umbilical artery cord blood gases, universal cord blood gas collection may have additional advantages from a quality perspective. First off, when cord blood gases are only taken when a baby has a low Apgar score, they are frequently taken in an emergency situation. In this situation, getting cord blood gases is crucial, thus having a regular strategy to collection is probably going to increase the likelihood of getting a successful and understandable sample of cord blood gases. Second, whether the cord blood gas results are normal or abnormal, they can be used to interpret the foetal heart rate monitoring strip to help with quality control.

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