*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 12 Ver. IV (December. 2016), PP 45-50*
*www.iosrjournals.org*

# Study of umbilical cord arterial blood gas analysis in high risk newborn

Dr. Nidhi Kanani, Dr. Aarti M. Makwana, Dr. Yogesh N. Parikh,
Dr. Mitul B. Kalathia, Dr. Palak T. Hapani, Dr. Zalak Shah
*Second year resident in pediatric department, PDUMC Rajkot*
*Associate professor, pediatrics, PDUMC Rajkot*
*Professor and head pediatrics, PDUMC Rajkot*
*Assistant professor, pediatrics, PDUMC Rajkot*
*Associate professor, pediatrics, PDUMC Rajkot*
*Assistant professor, pediatrics, PDUMC Rajkot*

## I. Introduction:-

Journey through birth canal is the first but probably the most hazardous journey an individual undertaken. Umbilical artery reflects most accurately fetal blood and tissue acid base status [(1)]. It has since become widely accepted that umbilical cord blood gas analysis can provide important information about the past, present and possibly the future condition of the infant. Identification and prevention of fetal academia is, therefore, the aim of intra partum fetal monitoring, the cord arterial blood pH is considered a crucial outcome measure [(2)].

Although cord acid-base assessment provides an objective measure of neonatal condition at delivery, there is a lack of correlation with other measure of neonatal condition and long-term outcome in some studies. Still many investigators believe that universal use of Umbilical Cord Blood Gas analysis can improve neonatal outcomes [(3, 4, 5)], however, no studies have evaluated this contention. Also till date no local study has been published to evaluate this relationship. The aim of this study was to detect the significance of cord arterial blood pH in cases of intra partum hypoxia (fetal distress) as a predictor of neonatal outcome.

PH assessment of cord ABG analysis is an objective diagnostic method for high risk newborns that may be at risk for poor neurologic outcome like birth asphyxia [(6)] . APGAR score is not an objective method to assess the outcome. Most cerebral palsy patients had normal APGAR score at birth [(7)].

**Aims and objectives** :-

1) To determine the association of cord arterial blood pH, $pco_2$ and $po_2$ with short term neonatal outcome in cases of high risk neonates.
2) To find correlation between cord blood ph and mode of delivery.
3) To find correlation with APGAR score and umbilical cord blood values.

**Study Design:**- Descriptive analytical study.
**Duration of Study:**- Total 50 cases of high risk neonates were studied within September 2016 to November 2016.

## II. Material and Methodology:-

This study carried out at K.T. Children hospital having tertiary care NICU, Rajkot. The study was approved by the university ethics committee and informed consents were taken from the parents. Neonates who born to a high risk mother between September 2016 to November 2016 based on neonatal resuscitation program (NRP) [(8)] were included in the study.

INCLUSION CRITERIA: Baseline fetal heart rate <110 and variability <5bpm.
Meconium stained amniotic fluid.
All high risk pregnancies (anemia, hypertension, thyroid disorder, diabetic mother, epilepsy, asthma etc).
Intrauterine growth retardation.
Preterm
EXCLUSION CRITERIA: Previous cesarean section with impending rupture. Intrauterine fetal death.
Fetus with congenital anomaly.

Maternal infection.

A segment of umbilical cord (minimum recommended length 10 cm) was double clamped immediately after delivery and before first breath, excised and placed into kidney tray. Umbilical arterial blood samples were

taken by 2nd year resident in pre-heparinized syringes (add 1 ml of liquid heparin into 2 ml syringe, moving plunger up and down and expelling residual heparin) and analyzed by ABG analyzer (I-stat) within 30 minutes after birth. Data including pH, $PO_2$, $PCO_2$, base deficit and bicarbonate along with demographic data like maternal risk factor and age, gestational age, weight and sex of neonates, neonatal outcome measures (healthy, NICU admission or neonatal death), color of liquor and mode of delivery, APGAR score at birth and after 5 minutes were recorded on predesigned proforma.

**Outcome Variable:-**

1) Healthy neonates not required resuscitation or NICU admission at birth.
2) Required NICU admission and need conservative management only.
3) Require ventilatory support and successfully discharged.
4) Neonatal death.

## III. Results:-

**Table I**

| High Risk Pregnancy | Total Cases | Nicu Admission | Normal Vaginal Deliery | Assisted Vaginal Delivery | Ceaserians Section |
|---|---|---|---|---|---|
| meconium stained liquor | **13** | **9** | **3** | **2** | **8** |
| Anemia | **9** | **3** | **5** | **3** | **1** |
| Pregnancy induced hypertension | **6** | **3** | **1** | **2** | **3** |
| Preterm | **6** | **5** | **3** | **0** | **3** |
| Intrauterine growth retardation | **6** | **4** | **3** | **1** | **2** |
| Fetal distress | **6** | **5** | **0** | **2** | **4** |
| Diabetic mother | **3** | **3** | **0** | **1** | **2** |
| Thyroid disorder | **1** | **0** | **1** | **0** | **0** |
| **Total cases** | **50** | **32** | **16** | **11** | **23** |

**Table II/I:-** Comparison of umbilical arterial cord blood Ph with neonatal outcome: (n=50) (x2=5.41,p=0.019) (odds ratio=4.5)

| Neonatal Outcome | pH <7.25 | pH >7.25 |
|---|---|---|
| **Healthy (No NICU Admission)** | **4** | **14** |
| **NICU Admission** | | |
| **Conservative management** | **4** | **13** |
| **Required ventilatory support and discharged successfully** | **9** | **1** |
| **Neonatal death** | **5** | **0** |
| | **22** | **28** |

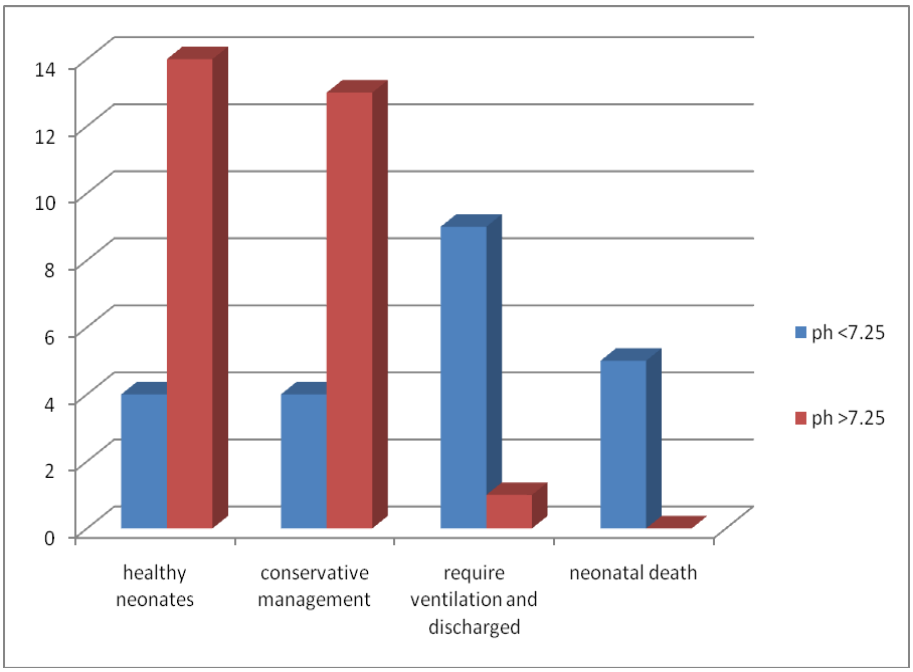

**TABLE II/II :-** Comparison of umbilical arterial cord blood $PCO_2$ with neonatal outcome: (n=5o) (x2=12.56,p=.00) (odds ratio 21.86)

| **Neonatal outcome** | **$PCO_2$ >50** | **$PCO_2$ <50** |
|---|---|---|
| **Healthy (no NICU admission)** | **1** | **17** |
| **Conservative management** | **3** | **14** |
| **Required ventilatory support and discharged successfully** | **10** | **0** |
| **Neonatal death** | **5** | **O** |
| | **19** | **31** |
| | | |

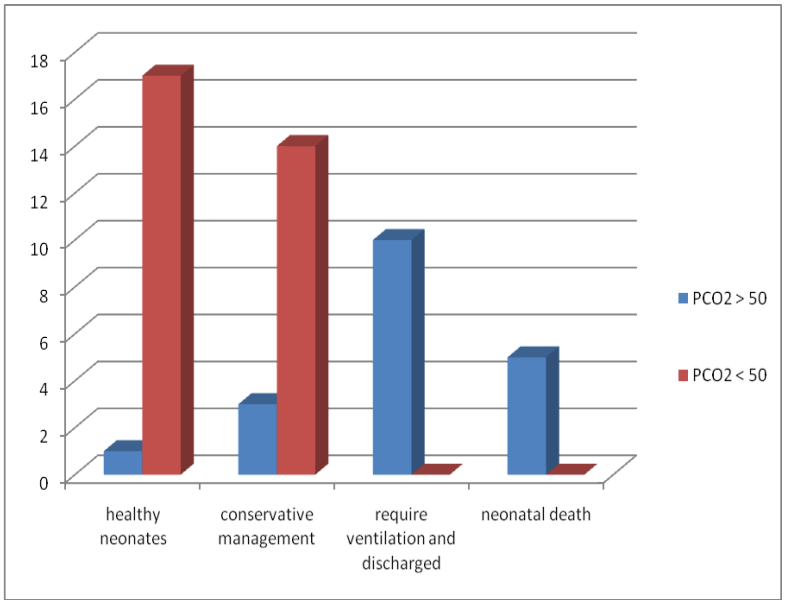


**Table II/III:-** Comparison of umbilical arterial cord blood $PO_2$ with neonatal outcome: (n=50) (x2=13.23,p=0.00)

| **Neonatal outcome** | **$PO_2$ <40** | **$PO_2$ >40** |
|---|---|---|
| **Healthy (no NICU admission)** | **0** | **18** |
| **Conservative management** | **1** | **16** |
| **Required ventilatory support and discharged successfully** | **10** | **0** |
| **Neonatal death** | **5** | **O** |
| | **16** | **34** |
| | | |

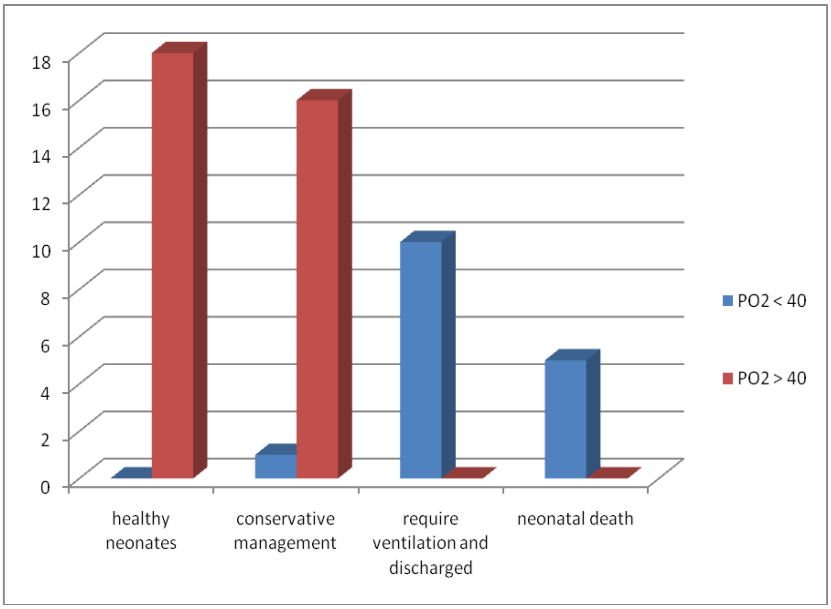

**Table III:-** Co-relation of umbilical arterial cord blood Ph and mode of delivery: (x2=8.76,p=0.01) (odds=11.55)

| Mode of delivery | pH <7.25 | pH >7.25 |
|---|---|---|
| Normal vaginal delivery | 3 | 13 |
| Assisted vaginal delivery | 8 | 3 |
| Ceaserian section | 11 | 12 |
| | 22 | 28 |

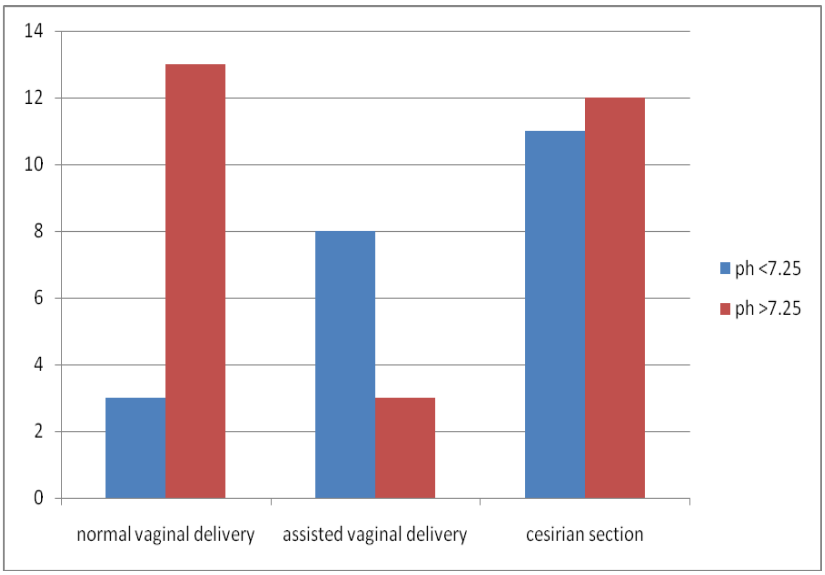


**Table IV:- relation of umbilical arterial cord blood Ph, $PCO_2$, $PO_2$ and APGAR score at birth and after 5 minutes of birth:**

**APGAR at Birth (x2=14.55, p=0.00)**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| pH <7.25 | 11 | 11 | 22 |
| pH >7.25 | 1 | 27 | 28 |
| | 12 | 38 | 50 |

**APGAR at 5 minute (x2=8.67, p=0.003)**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| pH <7.25 | 6 | 16 | 22 |
| pH >7.25 | 0 | 28 | 28 |
| | 6 | 44 | 50 |

**APGAR at Birth (x2=25.76, P=0.00)**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| $PCO_2$ >50 | 12 | 7 | 19 |
| $PCO_2$ <50 | 0 | 31 | 31 |
| | 12 | 38 | 50 |

**APGAR at 5 minute (x2=11.12, p=0.00)**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| $PCO_2$ >50 | 6 | 13 | 19 |
| $PCO_2$ <50 | 0 | 31 | 31 |
| | 6 | 44 | 50 |

**APGAR at Birth (x2=25.83, p=0.00)**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| $PO_2$ <40 | 11 | 5 | 16 |
| $PO_2$ >40 | 1 | 33 | 34 |
| | 12 | 38 | 50 |

**APGAR at 5 minute (x2=14.87, p=00)sssss**

| | APGAR <7 | APGAR >7 | |
|---|---|---|---|
| $PO_2$ <40 | 6 | 10 | 16 |
| $PO_2$ >40 | 0 | 34 | 34 |
| | 6 | 44 | 50 |

## IV. Discussion:-

Table I suggest that most common cause of high risk pregnancy is meconium stained liquor 13 out of 50(26%) which are mostly delivered by cesarean section followed by severe anemia 9 out of 50(18%). Most adverse outcome in term of NICU admissions are fetal distress and preterm delivery - 5 out of 6 (83%) admitted in NICU.

Table II/I suggest that most of healthy neonates (14 out of 50) have pH>7.25. Most of neonates require ventilatory support having academia (9 out of 10). All neonatal who died have ph<7.25 at birth. Victory et al. found that there is a progression of risk in term infants for NICU admission and need for assisted ventilation with worsening acidosis at birth [(9)]. Table II/II and II/III suggest that most of patients who required mechanical ventilation and all patients who died had their $PCO_2$ >50 and $PO_2$ <40.

Table III suggest that most of academic neonates 11out of 22 (50%) delivered by emergency cesarean section. Majority patient delivered by assisted vaginal delivery 8 out of 11 (72%) having academia.

Table IV suggest that most of patient (11 out of 12) having APGAR score <7 at birth are academia. And all the patients having APGAR score <7 after 5 minutes (6 out of 6) have ph <7.25, $PCO_2$ >50 and $PO_2$<40. There is a significant relationship between umbilical cord Ph, $PCO_2$, $PO_2$ and the selected neonatal outcomes like APGAR less than 7 at 5 minute as evident from other studies [(10)].

**Limitations:-**

1) Sample size was small so numbers of cord blood pH value < 7.00 were few, therefore, effect of severe metabolic academia could not be assessed effective
2) Only arterial pH was analyzed as this is the most commonly used measure although paired venous and arterial sample and base deficit analysis are also important in detecting the relationship of neonatal outcome with academia.
3) Long term follow-up data was lacking. More local studies with larger sample size are recommended to find the neurological squeals especially for cord pH < 7.1.

## V. Conclusion

There is significant association of umbilical cord arterial blood gas pH, $PCO_2$ and $PO_2$ values and adverse neonatal outcome.

## Reference:


[1]. Chauhan SP, Gupta LM, Assel Barbara, Magann EF, Magnann JC, Gupta Usha. Intrapartum featal survillence: summary of four national evidence based guidelines and need to develop Indian guidelines. The Journal Of Obstetrics and Gynecology Of India May/June2011;61(3):267-274. .

[2]. Yeh P, Emary K, Impey L. The relationship between umbilical cord blood arterial pH and serious adverse neonatal outcome: analysis of 51519 consecutive validated samples. Br J Obstet Gynecol 2012; 119:824-31.

[3]. White RH, Doherty DA, Henderson JJ, Kohan R, Newnham JP, Pennell CE. Benefits of introducing universal umbilical cord blood gas and lactate analysis into an Obstetric Unit. Aust NZ J Obstet Gynecol 2012; 50:318-28.

[4]. Waugh J, Johnson A, Farkas A. Analysis of cord blood gas at delivery: questionnaire study of practice in the United Kingdom. BMJ 2001; 328:727.6

[5]. Goldabar KG, Gilstrap LC, Leveno KJ, Dax JS, Mc Intyre DD, Pathologic fetal acidemia. Obstet Gynecol 1991; 78:1103-7

[6]. White CR, Doherty DA, Henderson JJ, Kohan R, Newnham JP, Pennell CE. Benefits of introducing universal umbilical cord blood gas and lactate analysis into an obstetric unit. Aust N Z J Obstet Gynaecol.2010;50(4):318–28. doi: 10.1111/j.1479-828X.2010.01192.x. [PubMed] [Cross Ref]

[7]. Vukojevic M, Soldo I, Granic D. Risk factors associated with cerebral palsy in newborns. Coll Antropol.2009;33 Suppl 2:199–201. [PubMed]

[8]. Kattwinkel J. NRP Neonatal Resuscitation Textbook 6th Edition (English version). 6th Edition ed. American Academy of Pediatrics and American Heart Association Guidelines for Neonatal Resuscitation; 2011.

[9]. Victory R, Penava D, Da Silva O, Natale R, Richardson B. Umbilical cord pH and base excess values in relation to adverse outcome events for infants delivering at term. Am J Obstet Gynecol. 2004;191(6):2021–8. doi: 10.1016/j.ajog.2004.04.026. [PubMed] [Cross Ref]

[10]. Richardson B, Natale R, Silva OD, Penava D, Victory R, Umbilical cord pH and base excess values in relation to adverse outcome events for infants delivering at term. Am J Obstet Gynecol 2004; 191: 2021-8.