



Prospective study to evaluate correlation between umbilical cord blood pH at birth and perinatal outcome in relation to the mode of delivery

Shweta Goyal¹, Gargi Sen², Dipnarayan Sarkar³, Subhendu Choudhury⁴, Debasish Bhattacharjee⁵,
Sudip Saha⁶

1- Junior resident, deptt of gynecology, IPGME&R. 2-Assist Professor deptt of biochemistry, BIN. 3- Assist Professor deptt of gynecology, IPGME&R. 4- Senior resident deptt of gynecology, IPGME&R. 5- Assist Professor deptt of biochemistry, Medical College Kol. 6- Professor deptt of gynecology, IPGME&R

Submission Date: 26-06-2014, Acceptance Date: 15-07-2014, Publication Date: 31-07-2014

How to cite this article:

Vancouver/ICMJE Style

Goyal S, Sen G, Sarkar D, Choudhury S, Bhattacharjee D, Saha S. Prospective study to evaluate correlation between umbilical cord blood pH at birth and perinatal outcome in relation to the mode of delivery. *Int J Res Health Sci* [Internet]. 2014 Jul 31;2(3):792-9. Available from <http://www.ijrhs.com/issues.php?val=Volume2&iss=Issue3>

Harvard style

Goyal S, Sen G, Sarkar D, Choudhury S, Bhattacharjee D, Saha S. Prospective study to evaluate correlation between umbilical cord blood pH at birth and perinatal outcome in relation to the mode of delivery. *Int J Res Health Sci*. [Online] 2(3). p.792-9 Available from: <http://www.ijrhs.com/issues.php?val=Volume2&iss=Issue3>

Corresponding Author:

Dr.Dipnarayan sarkar. Assistant professor. Department of Obstetrics and Gynaecology IPGME&R and SSKM Hospital AJC BOSE Road Kolkata-20. State: West Bengal, India. Email id: sarkardrdipnarayan@gmail.com

Abstract:

Background Umbilical cord acid - base analysis is the most objective assessment of the acid - base status at birth.

Method: Total 159 antenatal mother with singleton pregnancy of 34 to 42 completed gestational weeks were taken for this study. Cord blood was collected just after delivery and analysed within 30 minutes by ABG machine in NICU. **Results:** Mean gestational period was lowest in emergency LSCS (37.34 ± 1.57) followed by elective LSCS, normal delivery and highest in instrumental delivery (39.30 ± 1.71). Mean labour duration was lowest in emergency LSCS (9.90 ± 4.53), followed by normal vaginal delivery, and highest in instrumental delivery (14.23 ± 24). Mean cord blood pH was lower in instrumental vaginal delivery (6.99 ± 38) followed by normal delivery, emergency LSCS and highest pH value in elective LSCS (7.3 ± 33). Lowest mean Apgar score was obtained in instrumental vaginal delivery (5.70 ± 1.149), followed by normal vaginal delivery, emergency LSCS and finally with highest mean Apgar score in elective LSCS (7.6 ± 1.095).

Conclusions: Association between umbilical cord blood pH level and others variable help in assessing perinatal outcome like Apgar score, low birth weight, NICU admission; labour duration was found to be statistically significance in relation to the mode of delivery

Key words: Acidosis; Cord blood Ph; Fetus; NICU; Perinatal hypoxia; Umbilical cord

Introduction

Umbilical cord blood pH is considered as the best available criterion for the determination of fetal hypoxia (during labour) and its consequent perinatal outcome. Umbilical cord blood analysis supplies important information about a newborn's biochemical status prior to delivery [1]. During

labour maternal blood supply to placenta is normally interrupted during uterine contractions so that oxygen level in fetal blood fall during contractions and recover once placental blood flow resumes. Thus a relative oxygen deficiency is a part of normal labour. If hypoxia is prolonged, anaerobic metabolism results and base excess rises secondary

to presence of lactic acidosis. Excessive lactate accumulation may contribute to the damage of vital organs.

When a fetus is subjected to a massive perinatal hypoxic ischaemic insult, fetus may suffer sufficient damage to cause intrauterine death and stillbirth [2]. In less severe, non fatal cases, prolonged or severe intrauterine hypoxia may lead to serious neonatal complications like Hypoxic Ischaemic Encephalopathy, Cerebral Palsy, impaired myocardial function, seizures, Intraventricular haemorrhage and delayed development [3].

Cerebral palsy is thought to occur more frequently at an arterial cord blood pH of <7.00 [4]. However these criterions have been derived through consensus and not through summary of evidence leading to clinical uncertainty [5,6]. Since the association between umbilical cord blood pH at birth and perinatal outcome have been derived through consensus [7]. And not through evaluation of evidences, it is therefore necessary that validity of this association be supported with high quality evidence.

In this context, objective of our study to evaluate and identify the association between umbilical cord blood pH at birth and perinatal outcome. Additionally, we will compare the cord blood pH at birth with perinatal outcomes in relation to the mode of delivery in an attempt to ascertain any association between the two variables.

Materials and Methods

The present study was conducted over a period of 1 year (June 2011-May 2012) by the Departments of Obstetrics and gynaecology and Department of Neonatology, Institute Of Postgraduate Medical Education and Research (I.P.G.M.E. & R.), S.S.K.M. Hospital, Kolkata. The study is a prospective observational longitudinal evaluation of 159 antenatal mothers with singleton pregnancies attending Obstetrics and Gynaecology for safe confinement during the specified period.

Inclusion Criterion: Singleton pregnancy, Live fetus, Pregnant mothers between 18-35 years, Pregnancy beyond 37 completed gestational week but less than 42 weeks.

Exclusion Criterion: Multiple pregnancies, Intrauterine fetal death, Known gross congenital anomaly, Intrapartum fetal death, Pregnant mother <18 yrs and >35 yrs.

Pregnant mother with gestational age less than 37 completed weeks but more than 42 weeks of gestation.

Approval from local ethical committee and written consent from participants was obtained prior to commencing of the study .

Maternal age was defined as age in completed years at the time of registration & parity as the number of previous pregnancies.

Neonatal variables of birth weight, Apgar score at birth, perinatal mortality, and admission to Neonatal Intensive Care Unit (NICU) were also recorded.

Within half an hour of birth, cord blood was collected from fetal side of the umbilical cord after double clamping of the umbilical cord, 0.2ml of Umbilical cord blood was collected in preheparinised syringe and cord blood was analyzed within 30 minutes in ABG machine (Osmotech OPTI CCA Blood Gas Analyzer) in NICU. Non clotted cord blood was discarded and their mode of delivery, Apgar score at birth, birth weight, and gestational age was noted.

Low birth weight is defined as weight <2500 gms irrespective of the gestational age. Low APGAR score was defined as 1 minute APGAR score <6 . Low pH was defined a pH <7 .

Statistical analysis

The numerical variables in individual categories were compared with Normal and Low cord blood pH by Student's unpaired t- test .The categorical variables in individual category were compared with Normal and Low cord blood pH by Fisher's exact test.

The strength of association between umbilical cord blood pH and individual or composite adverse perinatal outcome in individual category was expressed through odds ratio with 95% confidence interval.

Results

Maximum numbers of babies were delivered through Emergency LSCS which constituted 42.14% of total deliveries and minimum number was comprised by Elective LSCS 12.58% of total deliveries shown in Table 1

The mean APGAR score was also significantly low in low cord blood pH patients (5.15 ± 0.9) as compared to those with normal cord pH (8.18 ± 0.9) with a significant p value < 0.001 .
Table - 1 & 2

The Mean Cord Blood pH in those with normal pH was (7.43±0.2) and mean cord blood pH in those with low pH was (6.72±0.2) and the difference was statistically significant with p value of <0.001. Table- 1 & 2

Low birth weight baby was statistically significant only in Category-2 (Emergency LSCS) and category -4 (IVD) In category -4 p- value of 0.042 was significant but did not show increased risk in infants with low cord blood pH (Odds ratio of 0.16). Lower limit of 95% C.I. was <1(0.03) indicating that this result of significance held well for our study and not on the whole population. In category -2 LBW was found to be statistically significant (p- value -0.005) with 18 times increased risk and good association between the categorical variables (significant 95% C.I.4.46 - 76.023).Table 3

The infants of Category -1(NVD), Category 2(Emerg LSCS) and Category 4(IVD) required Nicu Admission. Risk was maximum in category -1.(56 times) followed by category -2 (risk 54 times) On analysis, major perinatal complication were HIE and sepsis.

In Category -2 (Emergency LSCS) both HIE and Sepsis were statistically significant (p- value <0.023) with 15 times more risk in infants with low cord blood pH .Since lower limit of 95% C.I. was deduced to be non – significant(0.79) it was concluded that this result of significance held good only for our study and not for the whole population.

In Category -3 (Elective. LSCS) HIE was statistically significant (p- value 0.032).There was 33 times more risk of occurrence in infants with low cord blood pH (ODDS Ratio of 33) with 95% confidence interval of 2 - 908.94 shown in TABLE 3&4

In our study on comparing all the 4 categories with each other to find out the variables which carry significance (p – value<0.05).On studying table-5 it is seen that only 4 below mentioned variables carried significance which are :-

- 1 .Gestational Period. (p – Value <0.001)
2. Labour duration. (p – Value <0.001)
3. Cord Blood Ph. (p – value 0.032)
4. APGAR score . (p – Value <0.001)

From TABLE-5 it is demonstrated that the Mean Gestational Period was lowest in Emergency LSCS (CAT 2) {37.34±1.57} followed by Elective LSCS (CAT 3) (37.95±1.36) followed by normal vaginal delivery(CAT 1) (38.29±2.24) followed

finally with highest in Instrumental vaginal delivery(CAT 4) (39.30±1.71).

From TABLE- 5 it is found that the Mean Labour Duration was lowest in Emergency LSCS (CAT 2) (9.90±4.53)followed by Normal Vaginal Delivery (CAT 1) (12.52±3.05) followed finally with highest mean lab our duration in Instrumental Vaginal Delivery(CAT 4) (14.23±2.49).

From TABLE- 5 it is found that the mean Cord Blood pH was lowest in IVD (CAT 4) {6.991±.38} followed by NVD group (CAT 1) (7.093±.41) followed by Emerge LSCS (CAT 2) (7.19±.41) followed finally with highest mean pH value by Elective LSCS (CAT 3)

Similarly the mean values of APGAR scores were also obtained for all 4 groups From table 5 it is found that the lowest mean APGAR score was obtained in Instrumental Vaginal Delivery (Cat4) being 5.70±1.149,followed by NVD group (CAT 1) (6.74±1.81),followed by Emergency LSCS group (CAT 2)(6.89±1.48)and finally with highest mean appgar score in ELECTIVE LSCS group (Cat 3) {7.60±1.095}.

At last it can be deduced that strength of association between umbilical cord blood pH and the APGAR Score in relation to the mode of delivery go in parallel in relation to the mode of delivery with maximum Acidemia (lowest cord blood pH) and worst APGAR Score in infants in Category 4 ,i.e., Instrumental Vaginal Delivery f/b category -1 ,i.e., Normal Vaginal Delivery f/b category -2 ,i.e., Emergency lscs and lowest Acidemia (highest cord blood pH) and best APGAR Score in category -3 ,i.e., Elective LSCS.

Discussion

Perinatal asphyxia is a major cause of neonatal and childhood morbidity and mortality and can be predicted by etal acidosis determined by umbilical cord blood pH at birth [8,9] . Metabolic acidosis in the umbilical cord artery has been accepted internationally as an essential criterion for defining 'Intrapartum Hypoxia [10].

Comparison of mean values of quantitative variables between low cord blood pH and normal cord blood pH of babies delivered via NVD, showed no statistical significant difference between following variables age of mother, gestational period, birth weight, NICU stay.

However the Labour Duration was significantly prolonged in low cord blood pH babies (13.7 ± 3.10) as compared to those with normal cord blood pH (11.46 ± 2.6) p value of 0.015 thus supporting previous studies which concluded that fall in cord blood pH increased in duration of second stage of labour with newborn delivered vaginally [11]. A, Labour duration in category 2 (Emergency LSCS) and in category 3 (Elective LSCS) was not found to be statistically significant contradicting Helwig et al who showed a stepwise reduction in mean umbilical arterial pH for infants born preterm, term, post term explained by the prevalence of a shorter duration of labour in preterm infants [12].

Mean APGAR Score of infants in all the four categories were found to be statistically significant. 90% of infants with low blood pH had low Apgar Score and only 4.55% of infants with normal blood pH had low Apgar Score and this was statistically significant at p-value <0.001 agreeing with Socol et al [13]. That neonates with an Apgar score less than or equal to 3 at 5 minutes and a complicated clinical course were more likely to have lower umbilical cord arterial pH measurements and higher base deficit values than did their counterparts with an uncomplicated clinical course.

In category 2 (Emergency LSCS), mean APGAR Score in infant with low cord blood pH was low than infant born with normal cord blood pH at p-value of <0.001 . Mean \pm std. deviation in normal cord blood pH was 7.85 ± 0.8 and Mean \pm std. deviation in low cord blood pH was 5.41 ± 0.9 .

In study conducted by M.A. Kacho et al [14]. They stated that there is a high correlation between the presence of perinatal risk factors and low umbilical cord blood pH and low Apgar score. The most common risk factor found in their study associated with low umbilical cord blood pH was Emergency cesarean section.

In our current study in category 3 (Elective LSCS), mean APGAR Score in infant with low cord blood pH was low than infant born with normal cord blood pH at statistically significant p-value of 0.0028. Mean \pm std. deviation in normal cord blood pH was 7.94 ± 0.7 and Mean \pm std. deviation in low cord blood pH was 5.25 ± 1.5 .

Similarly in CAT -4 (IVD) mean Apgar score was found to be statistically significant at p-value of 0.017.

Mean Cord blood pH in infant in all the four categories were found to be statistically significant. In our study we have found a significant relationship

of Mean Cord Blood pH in category 1 (NVD) with Mean \pm SD in normal cord blood pH was 7.43 ± 0.2 and Mean \pm SD in low cord blood pH was 6.72 ± 0.2 . (p-value of <0.001).

Umbilical cord blood pH is considered as the best available criterion for determination of foetal hypoxia during labour and perinatal outcome.

In our study we found complication in baby to be statistically significant in Category -1 (NVD), Category 2 (Emerg LSCS), Category -3 (Elect LSCS) with significant p-value with a significant risk in these categories, i.e., 25 times more risk in Category-1, 36 times greater in Category -2 and 33 times more risk in category-3 and with a significant 95% C.I.

In category -4 Complication in baby was found to be statistically insignificant with p-value of 0.427 but Odds ratio of 2.67 shows that risk is 2 times in low pH group with non-significant lower limit of 95% C.I.

Minguez et al [15]. In their long observation study of 138 infants assessed the effect of the mode of deliveries (Vaginal or LSCS) on survival, morbidity and long term psychomotor development. They found that mortality was higher in newborns delivered vaginally (49.3%) than those delivered by LSCS (23.1%).

Kolas et al [16]. Examine neonatal outcome among women with a planned LSCS and with planned vaginal deliveries at term and found that compared to planned vaginal deliveries, planned LSCS increase transfer rates to NICU from 5.2% to 9.8% and also risk of pulmonary disorders rose.

In our prospective study low birth weight was found to be statistically significant only in Category -2 (Emerg LSCS) and category -4 (IVD) but in category -4 p-value of 0.042 was significant but does not show increased risk in infants with low cord blood pH (Odds ratio of 0.16) and lower limit of 95% C.I. is <1 (0.03) so this means that this result of significance hold good only in our study and not on the whole population.

While in category -2 LBW was found to be statistically significant (p-value 0.005) with 18 times increased risk and good association with significant 95% C.I. (4.46 TO 76.023).

In a study by Tejnani and Verma [17]. They found a weak inverse association between umbilical artery pH and risk of respiratory distress syndrome in low birth infants (<2000 g).

We demonstrated in our study that infants of Category -1(NVD), Category 2 (Emerg LSCS) and Category 4(IVD) required NICU admission though the risk was found to be maximum in category -1 ,i.e. 56 times more. In category -2 risk was 54 times more.

In a study by Kolas et al on 18,653 singleton gestations to examine neonatal outcome among women with a planned LSCS and with planned vaginal deliveries [18]. They found that compared to planned vaginal deliveries, planned LSCS increase transfer rates to NICU from 5.2% to 9.8%.

Van den Berg PP et al in his study concluded that neonates with arterial pH <7.00 had increased neurological complication like seizures and increased NICU admissions[19].

In our prospective study we found that infants who were suffering from complications during perinatal outcome ,major complication in our study come out to be HIE and sepsis.

We found in study of ours we found that only in Category -2 (Emerg LSCS) both HIE and Sepsis came out to be statistically significant with p- value <0.023 in both and 15 times more risk in infants with low cord blood pH In Category -3(Elec. LSCS) HIE was found to be statistically significant with p- value of 0.032 and 33 times more risk of occurrence in infants with low cord blood pH (ODDS Ratio of 33) and with 95% confidence interval of 2 to 908.94.

Goodwin et al [20]. In their study stated that with worsening acidosis, morbidity increases. They found that at pH <7.00 ,Hypoxic ischemic encephalopathy occurs in 12% of infants ,33% with cord pH <6.9 ,60% with cord pH <6.8, and 80% with cord pH <6.7 .No infant was live born with pH <6.6.

Goldaber et al [21]. Studied the association between umbilical arterial acidosis and adverse neurological events among singleton infants with cord arterial pH <7.20.

Conclusion

From our study it can be concluded that lowest umbilical cord blood pH levels were noted among babies delivered by Instrumental Vaginal Delivery and Least Acidemia (Highest Cord Blood pH) was noted among babies delivered by Elective caesarean section. The same pattern was also followed by Apgar score with least favourable outcome in infants delivered instrumentally.

Also the association between umbilical cord blood pH levels and other variables which help in assessing perinatal outcome like APGAR score , Low Birth Weight , complication in baby , NICU Admission , gestational period , labour duration was found to be statistically significant in relation to the mode of delivery.

But since our sample size was small consisting of only 159 mothers and small duration of time ,i.e. only one year so further study with a larger sample of population and longer period of time is required in future to further predict the usefulness of measuring umbilical cord blood pH levels and assessing its role in predicting adverse perinatal outcome on whole population.

Our study highlights that cord blood pH levels are significantly related to the mode of delivery. It also finds a correlation between the umbilical cord blood pH levels and adverse perinatal outcome.

Our findings in this study of ours justify the use of measuring umbilical cord blood pH levels as an important outcome measure of perinatal outcome.

Source of Funding: Nil

Conflict of Interest: None

Acknowledgement:

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/editors/publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

References:

- 1.Uzan S, Berkane N, Verstraete L, Mathieu E, Breart G. Acid base balance in during labour :pathophysiology and exploration methods .J Gynecol Obstet Biol Reprod (Paris) .2003;32(1 Suppl)1S68-78.
2. Luckas M, Thomson\ A , Aird I. Deaths related to intrapartum asphyxia .Consultant expansion in obstetrics and gynaecology is not fast enough. BMJ 1998; 316:1319.
- 3.Bastian H, Keirse MJNC ,Lancaster PAL .Perinatal death associated with planned home birth in Australia: population based study. BMJ1998;317:384-388

4. Dear P, Newell S, Rosenbloom L, Rennie JM, MacLennan A. Establishing probable cause in cerebral palsy. *BMJ* 2000; 320:1075.
5. Low JA, Panagiotopoulos C, Derrick EJ. Newborn complications after intrapartum asphyxia with metabolic acidosis in the term fetus. *Am J Obstet Gynecol* 1994;170:1081-1087.
6. MacLennan A. A template for defining a causal relation between acute intrapartum events and cerebral palsy: international consensus statement *BMJ* 1999;319:1054-9.
7. Dijkhoorn MJ, Visser GH, Huisjes HJ, Fidler V, Touwen BC. The relation between umbilical pH values and neonatal neurological morbidity in full term appropriate-for-dates infants. *Early Hum Dev* 1985;11:33-42.
8. Heller G, Schnell RR, Misselwitz B, Schmidt S. Umbilical blood pH, Apgar scores, and early neonatal mortality's *Geburtshilfe Neonatal* 2003;207:84-9.
9. Fahey J, King TL. Intrauterine asphyxia; clinical implications for providers of intrapartum care. *J Midwifery Women's Health* 2005; 50:498-506.
10. ACOG Committee Opinion No. 348, November 2006: umbilical cord blood gas and acid base analysis. *Obstet Gynecol* 2006;108:1319-22.
11. Yoon BH, Kim SW. The effect of labour on normal values of umbilical blood acid-base status. *Acta Obstet Gynecol Scand*, 1994 Aug;73(7):556-61.
12. Helwig JT, Parer JT, Kilpatrick SJ, et al. Umbilical cord blood acid-base state: what is normal? *Am J Obstet Gynecol*, 1996;174:1807-12.
13. Socol ML, Garica PM, Riter S. Depressed Apgar scores acid-base status and neurologic outcome. *Am J Obstet Gynecol*. 1994;170(4):991-9.
14. Kacho MA, Asnafi N, Javadian M, Hajiahmadi M, Taleghani NH. Correlation between umbilical cord pH Apgar score in High-risk pregnancy. *Iran J Pediatr*. 2010;20(94):401-6.
15. Minguez-Millio JA, Alcazar JL, Auba M, Ruiz-Zambrana A, and Minguez J. Perinatal outcome and long term follow up of extremely low birth weight infants depending on the mode of delivery. *J Matern Fetal Neonatal Med*. 2011 Oct 24(10):1235-8.
16. Kolas T, Sangstad DD, Daltret AK, Nilsen ST, Oran P. Planned cesarean versus planned vaginal deliveries at term: comparison of newborn infant outcomes. *Am J Obstet Gynecol* 2006 Dec; 195(6):1538-43.
17. Tejani N, Verma UL. Correlation of Apgar scores and umbilical artery acid-base status to mortality and morbidity in the low birth weight neonates. *Obstet Gynecol* 1989;73:597-600.
18. Van Den Berg PP, Nelen WLD, Jongsma HW, Nijland R, Kolee LAA, Nijhuis HW, et al. Neonatal complications in newborn with an umbilical artery pH <7.00. *Am J Obstet Gynecol* 1966;175:1152-7.
20. Goodwin TM, Belai I, Hernandez P, et al. Asphyxia complications in the term newborn with severe umbilical acidemia. *Am J Obstet Gynecol* 1992;167:1506-12.
21. *Gynecol* 1991; 78:1103-7.
46. Goldaber KG, Gilstrap LC 3rd, Leveno KJ, et al. Pathologic fetal acidemia. *Obstet*

Table 1: Showing mode of delivery, mean \pm standard deviation and p- Value of APGAR score depending on cord blood ph in 4 categories:-

Category	Mode of delivery	frequency	percentage	Apgar score in Normal cord blood pH (Mean \pm SD)	Apgar score in Low cord blood pH (Mean \pm SD)	p-value
Cat 1	NVD	42	20.42%	8.18 \pm 0.9	5.15 \pm 0.9	<0.001
Cat 2	Eiec LSCS	67	42.14%	7.85 \pm 0.8	5.41 \pm 0.9	<0.001
Cat 3	Emer LSCS	20	12.58%	7.94 \pm 0.7	5.25 \pm 1.5	0.0028
Cat 4	IVD	30	18.87%	6.44 \pm 1.7	5.38 \pm 0.7	0.017

Table 2: Showing MEAN ± STANDARD DEVIATION AND p- VALUE of cord blood PH in 4 categories:-

category	Mode of delivery	frequency	percentage	Normal cord blood pH (Mean±SD)	Low cord blood pH(Mean±SD)	p-value
Cat 1	NVD	42	20.42%	7.43± 0.2	6.72±0.2	<0.001
Cat 2	Elective LSCS	67	42.14%	7.47 ± 0.2	6.76±0.2	<0.001
Cat 3	Emergency LSCS	20	12.58%	7.43± 0.2	6.79 ±0.1.	<0.001
Cat 4	IVD	30	18.87%	7.51±0.3	6.77±0.1	<0.001

Mean Cord blood pH and APGAR SCORE of babies in all the four categories were found to be statistically significant . p – value of <0.001 ..

TABLE 3: Showing odds ratio, 95% confidence interval, and p- value in categorical variables of category -1 and 2

VARIABLES	ODDS RATIO		C.I.-95%		C.I +95%		p- value	
	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 2
Apgar score	189	487.50	15.79	41.94	2262	5666.4	<0.001	<0.001
Lowbirth weight	4.00	18.42	1.094	4.46	14.63	76.023	0.60	0.005
NICU admission	56.67	54.27	8.45	11.80	379.77	249.59	<0.001	<0.001
Sepsis	9	15.51	0.435	0.79	186.10	301.23	0.10	0.023
HIE	2.33	15.51	0.19	0.79	27.94	301.23	0.60	0.023

ODDS ratio is defined as significant when >1.95% Confidence interval shows significant association when lower limit is >1.

Table 4: Showing odds ratio, 95% confidence interval, and p- value in categorical variables of category 3 and 4

VARIABLES	ODDS RATIO		C.I.-95%		C.I +95%		p- value	
	Cat 3	Cat 4	Cat 3	Cat 4	Cat 3	Cat 4	Cat 3	Cat 4
Apgar score	33	79.86	2.0	3.63	908.94	1757	0.032	<0.001
Lowbirth weight	0.56	0.16	6.046	0.03	6.63	0.86	1.000	0.042
NICU admission	33	35.18	2.0	1.63	908.94	757.08	0.032	0.005
Sepsis	33	2.44	2.0	0.1	908.94	55.98	0.032	1.000
HIE	33	6.33	2.0	0.31	908.94	127.70	0.032	0.29

Table 5: Showing descriptive statistics of numerical variable for all mode of delivery

VARIABLES	CATEGORY	N	MEAN	STD.DEVIATION	p- VALUE
Gest Period	1	42	38.29	2.24	<0.001
	2	67	37.34	1.57	
	3	20	37.95	1.36	
	4	30	39.30	1.71	
	TOTAL	159	38.04	1.90	
Labor Dur	1	42	12.52	3.05	<0.001
	2	67	9.90	4.53	
	3	NA	NA	NA	
	4	30	14.23	2.49	
	TOTAL	159	11.82	4.02	
Cord Bl pH	1	42	7.09	0.41	0.031
	2	67	7.19	0.41	
	3	20	7.30	0.33	
	4	30	6.99	0.38	
	TOTAL	159	7.14	0.40	
Apgar	1	42	6.74	1.81	<0.001
	2	67	6.89	1.48	
	3	20	7.60	1.09	
	4	30	5.70	1.15	
	TOTAL	159	6.70	1.57	