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Original Research Article

Study to evaluate correlation between immediate fetal outcome, cord blood pH and causes of fetal distress in low risk patients undergoing emergency caesarean section

Deepshikha Sahu[1], **Varuna Pathak**[1,*]

[1] *Dept. of Obstetrics and Gynaecology, GMC, Bhopal, Madhya Pradesh, India*

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ABSTRACT

Introduction: In recent years, Caesarean section rates are increased and mostcommon indication being fetal distress. Fetal distress basically occurs due to fetal hypoxemia because of various reasons either maternal or fetal cause. Thus, to know the immediate outcome of baby
delivered through caesarean section, umbilical cord blood pH has emerged out to be the best indicator of fetal hypoxemia and to give the prognosis of baby delivered.

Aims and Objectives: To study the relation between cause of fetal distress and umblical cord blood pH. To study the impact of different cause of fetal distress on immediate post partum baby delivered by emergency caesarean section.

Materials and Methods: This study was a Cross-sectional observational study conducted during period from 01.03.2017 to 28.02.2018 in the department of Obstetrics and Gynaecology, SZ Hospital and Gandhi Medical College, Bhopal. 270 patients Undergoing Emergency Caesarean Section for Fetal Distress diagnosed clinically were selected in the Study during the study period. Data was collected as pre-designed pre tested questionnaire of study variables. Blood collection was performed following delivery by caesarean section, from immediately isolated segment (10 to 20 cm) of cord and sent for pH analysis via radiometer ABL system 600.

Result: Distribution according to etiology of fetal distress, it was recognized that post dated pregnancy were maximum 106(39.3%) (majority underwent induction of labour), oligohydroaminos secured second position 74(27.4%). Relation between pH value and cause of fetal distress to the fetal outcome we found out that, irregular rhythm heart rate babies (18 out 0f 270) had low pH value .i.e. <7.1 with maximum referrals to NICU and cause being abruption placenta.

Conclusion: The study concludes that decision of emergency caesarean section based on intermittent auscultation of fetal heart rate during intrapartum correlates well with the final outcome and this correlation being further confirmed by umbilical arterial cord pH.

1. Introduction

The world of obstetrics rotates around its final outcome in terms of a healthy baby, who cries immediately at birth and goes home with its mother without any interventions. Delayed cry of a neonate due to antenatal or intranatal asphyxia, requiring extensive interventions or unwanted morbidity or mortality. In recent years, Caesarean section rates are increased and most common indication being fetal distress. Fetal distress may be defined as a physiological state in which there is metabolic acidosis secondary to hypoxia.

Fetal distress basically occurs due to fetal hypoxemia because of various reasons either maternal or fetal cause. Non-reassuring fetal status is not an adverse event per se, but rather an indication of an underlying condition resulting in temporary or permanent oxygen deprivation to the fetus which may lead to fetal HYPOXIA AND METABOLIC ACIDOSIS.[1] Thus, to know the immediate outcome of baby delivered through caesarean section, umbilical cord

* *Corresponding author*.
E-mail address: drshikha991990@gmail.com (V. Pathak).

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blood pH has emerged out to be the best indicator of fetal hypoxemia and to give the prognosis of baby delivered.

This study attempts to find, How effective are intermittent fetal heart rate monitoring and other biochemical markers in cases of fetal distress? How relevant, reproducible and effective are they in identifying the fetuses at real risk of fetal distress. So as to require emergency caesarean section which is justified to their indication. By specifying the indications it becomes easier to decide the mode of delivery, urgency of delivery and choice of anesthesia.[2] Fetal hypoxia that may lead to indicate changes in fetal heart patterns, reduced fetal movement, fetal growth restriction and presence of meconium stained liquor.[3] The fetal heart rate changes markedly in response to prolonged oxygen deprivation, making fetal heart rate monitoring a potentially valuable and commonly used tool for assessing fetal oxygenation status in real time.[4]

2. Materials and Methods

This study was a cross sectional observational study conducted in Dept. of Obstetrics and Gynaecology Sultania Zanana Hospital and Gandhi Medical College Bhopal M.P. in duration between 1^{st} march 2017 to 28^{th} february 2018. Sample size of the study was selected as per Fishers formulla and it was 270. Patients were selected who underwent for caesarean section as per inclusion criteria.

2.1. Inclusion criteria

1. Patient giving informed consent. Caesarean section with the indication as fetal distress.
2. Gestational age of $\geq$ 37 weeks (completed) from the last menstrual period or first trimester scan.
3. The pregnancy must be singleton with cephalic presentation and longitudinal lie.

2.2. Exclusion criteria

1. Caesarean section done for other than fetal distress as indica tions.
2. Gestational weeks below 37 weeks
3. Mal-presentations
4. Multiple gestations
5. All high risks pregnancy (anemia, hypertension, thyroid disorders, diabetes epilepsy, asthma)
6. Elective caesarean sections

2.3. Sampling

All consecutive patients who underwent caesarean section for fetal distress from the start of the study until the target was reached were invited to participate in the study as long as they met the inclusion criteria and gave consent.

Data was collected as pre-designed pre tested questionnaire of study variables. Blood collection was performed following delivery by caesarean section, from immediately isolated segment (10 to 20 cm) of cord with two clamps near the neonate two clamps nearer the placenta. The importance of clamping the cord is underscored by the fact that delays of 20-30 secs can alter both the pCO2 and pH.

The cord was then cut between the two proximal and two distal clamps. Arterial blood was drawn from the isolated segment of cord into a 2 ml syringe that were pre heparinized lithium syringes. The needle was capped and the syringe transported on an ice bag to the laboratory (Although efforts should be made to transport the blood promptly, neither the pH nor pCO2 change significantly in blood kept at room temperature for up to 60 minutes). After that all the samples were tested for pH analysis via radiometer ABL system 600. All the outcomes were evaluated by appropriate statistical tests and results were outlined.

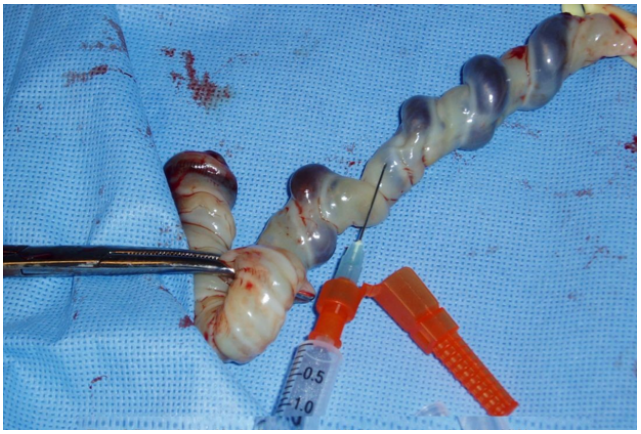

Fig. 1: Blood collection from umblical artery in are pre heparinized lithium syringes

3. Results

The present study of 270 cases “study to evaluate correlation between immediate fetal outcome, cord blood ph and causes of fetal distress in patients undergoing emergency cesarean section” was done and observations were evaluated by different statistical tests and outcome was assessed. Among 270 patients, who underwent emergency caesarean section 175 (64.8%) belong to urban area while 95 (35.2%) belong to rural area. Out of 270, maximum 79 (29.2%) had education level upto higher secondary , 68 (25.2%) had education upto high school, only 5 had graduation and 3 (1.1%) were post graduated. Out of 270 patients, 195(72.2%) were single-para and 75 (27.8%) were multi-para. All the patients were 18 to 36 year old and their mean age was 24.07 year. Mean gestational age was 39.61 year.

Out of 270 cases, among most of 106(39.3%) fetal distress was diagnosed in post dated subjects and among 74(27.4%) Oligohydraminos was the cause of fetal distress.

Fig. 2: Radiometer ABL 90 system 600

Table 1: Distribution of study subjects according to fetal distress & its etiology-

Causes of Fetal Distress		
No Cause found	16	5.9%
Oligohydraminos	74	27.4%
Post Dated	106	39.3%
Abruptio placenta	18	6.7%
Premature Rupture of Membrane	21	7.8%
Nuchal Cord	35	13.0%
Total	270	100.0%

In 16(5.9%) no cause was found.

Table 2: Distribution of study subjects according to cause of fetal distress with NICU admissions

Causes of Fetal Distress	**NICU admission (20)**	**Neodeath**
N o Cause	0	0
Oligohydraminos	0	0
Post Dated	6	0
Abruptio	14	10
Total	20	10

Out of 270, 14 babies of abruption placentae had NICU admissions followed by 06 babies of post datism. For other causes none had referral but abruption placentae babies were maximum neodeath. This was found to be statistically significant.

Table 3: Distribution of study subjects according to pH of umbilical arterial cord blood

pH of umbilical arterial cord blood	**Number**	**Percentage**
<7.1	14	5.2%
7.1-7.3	219	81.1 %
>7.3	37	13.7 %
Total	270	100.0 %

Out of 270 cases, among most of 219(81.1%), pH of Umbilical Arterial Cord Blood was 7.1 to 7.3 and among 37(13.7%), it was more than 7.3.

Out of 240 bradycardia patients, most of 202(74.8%) had 7.1 to 7.3 pH while 12(4.4%) patients with irregular heart rate had less than 7.1 pH. There was statistically significant association found in severity of fetal distress & pH of Umbilical Arterial Cord Blood. (p=0.001)

It shows 30(11.1%) cases with post dated cause of fetal distress had more than 7.3 pH and 12(4.4%) abruptio patients had less than 7.1. While most of patients in all causes had 7.1 to 7.3. There was statistically significant association found in causes of fetal distress & pH of Umbilical Arterial Cord Blood. (p=0.001)

For evaluating the immediate fetal outcome, umbilical arterial cord blood was collected to ascertain it's pH value to rule out fetal acidosis and Apgar score was calculated both at 1min and 5min.

Among the causes of fetal distress, abruptio placenta babies; at 1 minute 18(6.7%) had less than 3 APGAR score after 5 minute it increased and 8(6.7%) had 4-6 score. While among post dated cause, 106(39.3%) had 4-6 score at 1 minute and after 5 minute it increase and 89(33.0%) had 7-10 score. So there was statistically significant difference found in distribution of study subjects according to Causes of fetal distress & APGAR score. (p=0.001).

It was observed in the study that irregular fetal heart patterns seen in patients with abruption placenta (6.7%) had the babies with worst Apgar score <3 both at 1 minute and 5 minute. Out of 18 babies, 10 babies had poor Apgar score of <3 even at 5 minutes ; these babies also had umbilical arterial cord blood pH value < 7.1, needed intubation and NICU admissions, finally associated with neodeath on day 07. These observations were being highly significant to the p value; thus to correlate well with pH and denote fetal acidosis. But for remaining 8 babies, managed to improve their Apgar score of 4-6 at 5 minute, of these 08 babies 02 had pH value <7.1 which were alive but remain admitted in NICU till day 07; these babies could survive but could present with some of the complication of Hypoxic ischemic encephalopathy. Rest 06, though had poor Apgar at 1 minutes and improved at 5 minute had pH value between 7.1-7.3 can have better prognosis.

Table 4: Distribution of study subjects according to severity of fetal distress & pH of umbilical arterial cord blood

Fetal Distress	pH of Umbilical Arterial Cord Blood		
	<7.1	7.1-7.3	>7.3
	N (%)	N (%)	N (%)
Bradycardia	2(0.7%)	202(74.8%)	36(13.3%)
Tachycardia	0(0.0%)	11(4.1%)	1(0.4%)
Irregular	12(4.4%)	6(2.2%)	0(0.0%)
Total	14(5.2%)	219(81.1%)	37(13.7%)
Chi Square Value	49.320		
Significance 'p' Value	0.001(HS)		

Table 5: Distribution of study subjects according to causes of fetal distress & pH of umbilical arterial cord blood

	PH of Umbilical Arterial Cord Blood		
	<7.1	7.1-7.3	>7.3
Causes of Fetal Distress	N (%)	N (%)	N (%)
NO Cause	0(0.0%)	16(5.9%)	0(0.0%)
Oligohydraminos	0(0.0%)	74(27.5%)	0(0.0%)
Post Dated	2(0.7%)	74(27.5%)	30(11.1%)
Abruptio	12(4.4%)	6(2.2%)	0(0.0%)
Premature Rupture of Membrane	0(0.0%)	19(7.0%)	2(0.7%)
Nuchal Cord	0(0.0%)	30(11.1%)	5(1.9%)
Chi Square Value	91.350		
Significance 'p' Value	0.001(HS)		

Table 6: Reveals distribution of study subjects according to causes of fetal distress & APGAR score at 1 and 5 minutes

Fetal Distress	No Cause	Oligo- hydraminos N (%)	Post Dated N (%)	Abruptio N (%)	PROM	Nuchal Cord	p-Value
APGAR (1 Min)							
7-10	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	**0.001 (HS)**
4-6	16(5.9%)	74(27.4%)	106(39.3%)	0(0.0%)	21(7.8%)	35(13.0%)	
≤3	0(0.0%)	0(0.0%)	0(0.0%)	18(6.7%)	0(0.0%)	0(0.0%)	
APGAR (5 Min)							
7-10	15(5.6%)	58(21.5%)	89(33.0%)	0(0.0%)	18(6.7%)	28(10.4%)	**0.001 (HS)**
4-6	1(0.4%)	16(5.9%)	17(6.3%)	8(3.0%)	3(1.1%)	7(2.6%)	
≤3	0(0.0%)	0(0.0%)	0(0.0%)	10(3.7%)	0(0.0%)	0(0.0%)	
Total	16(5.9%)	74(27.4%)	106(39.3%)	18(6.7%)	21(7.8%)	35(13.0%)	

4. Discussion

This study aims to justify the ever increasing rate of caesarean section for indication of fetal distress by comparing the pH value of umbilical arterial cord blood and Apgar score of newborn.

Distribution according to etiology of fetal distress [Table 1] it was recognized that post dated pregnancy were maximum 106(39.3%) (majority underwent induction of labour), oligohydrominos secured second position 74(27.4%) followed by Nuchal cord 35(13.0%) and abruption was found to be a cause in 18 (6.7%) patients, however no cause could be identified in 16 patients. Similar opinion found in Manjusha Agarwal et al[20 17],[5] that stated that post dated pregnancy is the most common indication for increasing number of emergency caesarean section for fetal distress. Also, Richa Kansal, Isha Bansal et al[2017][6] and Kalavathi Dharam raj Biradar et al[2016][7] found that oligohydrominos is emerging as one of the common indication for emergency caesarean section for fetal distress.

Accordingly in Table 2; Out of 270 babies that were delivered during emergency caesarean section, 20 had NICU admissions with 10 baby died in 07 days of birth. However, these 10 babies had poorest pH value of <7.1 and all were being operated for abruption.

For discussion based on relation between pH value and cause of fetal distress to the fetal outcome we found out that, irregular rhythm heart rate babies had low pH value .i.e. <7.1 and maximum referrals with poor Apgar score at 1min (<3) and at 5min (<3). Out of 270 babies 18 had

Apgar score <3 at 1 min, out of which 10 continued to have Apgar score <3 at 5mins. These babies were referred to department of Pediatrics and were not alive beyond day 2-4. These 18 underwent emergency caesarean section for abruption placenta. Fouzia Perveen et al (2015)[8] also had similar results "Significance of cord arterial blood pH as a predictor of intrapartum hypoxia is considerable in determining neonatal outcome but at pH level > 7.1 the neonatal neurologic morbidity is not so evident. Although moderate degree of acidemia < 7.1 is associated with increased risk of adverse neonatal outcome, the absolute risks are very low and most affected babies have a higher pH than this as evident in this study."

According to Table 6 Oligohydrominos is also emerging to be as one of the major indication in current scenario. It usually takes 30-90 minutes to get a healthy baby delivered from diagnosis and decision to delivery interval of fetal distress. For babies, that are delivered after 90 minutes gap adversely affected the fetal outcome; well co-related with pH of umbilical arterial cord blood. In almost all cases of abruption placenta, babies who had irregular heart rate had poor Apgar score and reflected as acidotic babies with unfavourable pH<7.1.

Also similar findings seen by Pradeep Meena et al(2017)[9] also stated that "It was noted that as the severity of HIE increases, the values of mean APGAR score and cord blood pH decreases, which is inversely proportion to duration and severity of intrauterine/intra partum asphyxia.

Also, Goldaber et al (1991), who studied the association between umblical arterial acidosis and adverse neurological events among 3506 term, singleton infants with cord arterial pH < 7.20 ; 18 were reported that neonatal death was much more likely at pH< 7.00, the cut-off at which seizures became more likely was ph<7.05.

5. Conclusion

The study concludes that decision of emergency caesarean section based on intermittent auscultation of fetal heart rate during intrapartum correlates well with the final outcome; especially when emergency caesarean section is done timely. The correlation being further confirmed by umbilical arterial cord pH and Apgar score at birth.

6. Soruce of funding:

None.

7. Conflict of interest

None.

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Author biography

Deepshikha Sahu Resident

Varuna Pathak Professor

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