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Evaluation of the Relationship Between Fetal Distress and Ph of Umbilical Cord Artery of Neonates

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Abstract: Decreasing fetal distress and possible side effects of it is a golden aim in obstetrics, so diagnosis of fetal distress is important in labour. Beside high value of Apgar score in diagnosis of fetal distress it is not precisely a predictive factor. In perinatal period fetal distress is defined by meconium in amniotic fluid and abnormal patterns of fetal heart monitoring. This study was designed to determine the relation between fetal distress and umbilical cord pH in neonates at birth. This study was performed on 400 pregnant women referred to shahid Sadughi and Mojibian Labour Hospital and did not have any disorders except DM, PIH and hypothyroidism. In both case and control groups immediately after delivery one milliliter of umbilical cord artery was gathered by heparin syringe. Variables related to distress and demographic characteristics were gathered by a check list and analyzed by Chi-Square, Fisher Exact and T-Test. Mean ± SD of age in case and control group was 27.52±5.27 and 27.18±4.81, respectively. There was not a significant difference between groups. There was a significant difference between groups for first and 5th minutes APGAR scores. Acceleration and late deceleration were also related to fetal distress. In our survey, two neonates had pH less than 7.14 one between 7 to 7.2 and other was more than 7.2. Mean ± SD of pH was 7.35±0.09 and 7.36±0.07 in case and control groups, respectively. According to our data, baseline disorders of mothers including hypothyroidism, PIH, Overt DM and GDM had no relation with fetal distress. Beside this we can concluded that pH, PCO2 and Base Deficit of umbilical cord are not a precise predictive factor for fetal distress.

Key words: Fetal distress · Umbilical cord ph · APGAR

INTRODUCTION

Diagnosis of fetal distress through labor is important. A simultaneous evaluation of fetal heart rate and uterine contractions is the manner used in the world for fetal surveillance. Because of its low specificity this method has developed rates of surgical deliveries without a decrease in perinatal mortality [1].

Although the Cardiotogram(CTG) has a good sensitivity, ST-events happen at the similar frequency for normal and abnormal CTG patterns. This shows the need for more efficient information for detecting fetal response to hypoxemia [2, 3]. Normal results in CTG show that the fetus is in an enough oxygen situation [4]. Approximately 50 percent of results of CTG are not reliable and only a small part of these fetuses are in hypoxic situation. In these cases another high specific diagnostic test is needed. External monitoring is not as efficient as CTG [5] National collaborating center for women's and children's health introduced the monitoring of fetus and neonate as a manner of detecting hypoxemia and acidosis which can play an important role in neurological sequels [6].

In 1962, Saling *et al*. [7, 8] established a new way in detecting fetal distress due to hypoxia during labor in which sampling of blood from fetus scalp has been used. The cord pH has been considered as a definitive factor for fetus evaluation. Studies showed that low pH is significantly associated with long- term adverse

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consequences, but the level of pH which is determined for cut off point is not clear [9]. Normal range of umbilical cord pH is 7.40±0.20. mixed and pH less than 7 is important because in this range probability of seizure, mortality, intubation, NICU admission increases [10].

There is a growing attitude for using umbilical cord blood gas (UCBG) analysis on all deliveries to obtain an objective indicator of neonatal status and predict even if the fetus has been exposed to perinatal hypoxia [11] Hypoxemia activates the autonomic part of nervous system and it affects beat-to-beat heart rate [3].

Decreasing fetal distress and fetal morbidity and mortality is a golden aim in obstetrics. Fetal distress may be due to chronic hypoxia, mechanical trauma, hyperthermia, sepsis and meconium aspiration. In labor fetal distress has been diagnosed with abnormal fetal monitoring or finding meconium in amniotic fluid. It is suggested that some cerebral damages in newborn children are related to perinatal distresses [12].

Metabolic acidosis with evidence of neonatal neurologic disorders like seizure, hypotonia, single or multiple organ failure is depended on some situations including: pH of umbilical cord less than 7 and APGAR score less than 3, to mention the perinatal distress as a cause of cerebral damages [13].

Nowadays it is confirmed that the role of labor in the cerebral palsy have been limited and estimated up to 15% of children [14]. There are many factors that take part in developing cerebral encephalopathy which most of them happen before labor, but perinatal adventures in labor are mentioned because with suitable control of them risks of cerebral damages decrease till 0.2 folded [15].

This study was designed to evaluate the relation between fetal distress and umbilical cord pH in neonates.

MATERIALS AND METHODS

In this study, 400 neonates referred to the shahid Sadoughi and Mojibian labor hospitals in Yazd, Iran were evaluated. Children were divided into two groups; distress or not distress. Fetus abnormal Non Stress Test (NST) or Meconium in his amniotic fluid were considered as stress.

Women with medical diseases have been excluded from our study except Hypothyroidism, pregnancy induced hypertension and gestational Diabetes mellitus.

In both groups immediately after delivery (either vaginal delivery or Cesarean) umbilical cord was clamped and blood sample of umbilical artery was gathered in a heparin syringe. The sample was transmitted to the laboratory within 10 minutes by observing standard methods.

Weight of newborn was calculated in labor and Apgar scores were determined in 0 and 5 minutes after delivery. Other variables including age of mother, gestational age, site of neonate admission and status of umbilical cord (either compressed or not compressed) were gathered and entered in a check list.

All data were analyzed with descriptive and analytic tests of SPSS-11.

All the steps of this study were evaluated and confirmed by Research Committee of Shahid Sadughi Medical University and all patients took part in our study after ethical testimonial.

RESULTS

One of investigated women had vaginal bleeding and hypotension and with diagnosis of rupture of uterine and had undergone cesarean and her neonate was expired. Data of this neonate was omitted and analysis was done on 399 other pregnant women and their neonates.

The mean age of pregnant women in control group was calculated as 27.52±5.27 years old while it was 27.18±4.81 in case group. Analytic evaluations with T-Test showed that there was no significant (P-Value$\geq$0.05) difference between two groups regarding age (Table 1).

Mean gestational age in case group was 38.30 ±2.16 weeks and it was 38.53 ±1.56 weeks in control group. This difference was not significant (P-Value$\geq$0.05) between two groups (Table 1).

Mean Apgar score in 1st minute was 8.98 ±1.54 and 9.37 ±0.87 in case and control groups, respectively. This difference was significant between two groups (P-Value=0.001). While mean Apgar score in 5th minute was 9.67 ±0.82 and 9.84 ±0.60 in case and control group, respectively and this difference was significant between groups (P-Value=0.043) (Table 1).

Mean weight of neonates was 3015.22 ±572.86 gm in case group and 3086.93±496.10 gm in control group and there was no significant (P-Value$\geq$0.05) difference between groups (Table 1).

In this study, in 51 cases (12.8%) meconium was observed in amniotic fluid and 189 ones (47.3%) needed re-monitoring.

Table 1: Comparison of mother age, gestational age, Apgar score and birth weight in case and control groups

	Case group			Control group			Total			
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD	P-Value
Mother age	87	27.18	4.81	306	27.52	5.27	393	27.45	5.17	0.58
Gestational age	84	38.30	2.16	289	38.53	1.56	373	38.48	1.71	0.29
APGAR(0)	87	8.98	1.54	309	9.37	0.87	396	9.28	1.06	0.01
APGAR(5)	87	9.67	0.82	309	9.84	0.60	396	9.80	0.66	0.04
Birth weight	88	3015.22	572.86	307	3086.93	496.1	395	3070.9	514.20	0.24

Table 2:Comparison of pH, PCO2 and base deficit in case and control groups

	Case group			Control group			Total			
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD	P-Value
PH	87	7.35	0.09	310	7.36	0.07	397	7.36	0.07	0.659
PCO2	56	40.40	8.24	170	38.93	7.40	226	39.29	7.62	0.210
Base Deficit	57	-2.75	3.80	170	-2.73	4.19	227	-2.74	4.09	0.974

PCO2: carbon dioxide partial pressure Base Deficit: A decrease in the total concentration of bicarbonate indicative of metabolic acidosis or of compensated respiratory alkalosis. The Number Of case and control groups was changeable, because this study was case control and in all documents we could not find all data

In control group, 310 women who did not have meconium in their amniotic fluid or their fetus did not have abnormal NST, there was 8 women (2.6%) with overt diabetes mellitus while there was no report of this disorder in case group,89 women who had meconium in their amniotic fluid or abnormal NST in their fetus. Fisher Exact Test showed that there is not a significant (P-Value≥0.05) difference between groups (P-Value=0.208) and about gestational diabetes mellitus also results showed that there is not significant (P-Value≥0.05) difference between groups.

In this evaluation, 5 women (5.6%) among 89 women in case group and 13 ones (4.2%) in control group had pregnancy induced hypertension. Hypothyroidism was reported as 9 and 10% in case and control groups respectively. Analytic tests showed that there is no significant difference (P-Value≥0.05) between groups.

Fetal heart monitoring showed acceleration in 58.4 and 83.5% in case and control group, respectively. This difference was significant (P-Value=0.001). Early deceleration was also mentioned which was not significantly (P-Value≥0.05) different between two groups, but late deceleration was reported in two women in case group against no report of it in control group. This difference was a significant one (P-Value=0.049).

About delivery type in our study, 23.6% women in case group delivered by NVD while this proportion was 40% in control group and there was a significant difference between groups (P-Value=0.005).

Situation of umbilical cord was evaluated and free umbilical cord was reported in 76.4% of neonates in case group while this situation was 80.9% in control ones.

With following of neonates 70.8 and 85.6% of women in case and control group respectively were admitted after birth in NICU ward. Chi-Square test which was done showed that there is a significant difference between groups (P-Value=0.001).

In this survey, 2 neonates had pH lower than 7, 14 ones between 7 to 7.2 and others had pH more than 7.2. Mean ± SD of pH was determined to be 7.35±0.09 in case control while this was 7.36±0.07 in control group and this difference was not significant (P-Value≥0.05) (Table 2).

Comparison of groups about the relationship between birth weight, medical disease of mothers and acidosis showed that there was not a significant (P-Value≥0.05) relation between these factors and acidosis.

Comparison between pattern of fetal heart monitoring and acidosis showed that there was no significant (P-Value≥0.05) relation between them.

DISCUSSION

This study was performed on 399 pregnant women who were admitted to shahid Sadughi and Mojibian labor Hospitals of Yazd, Iran between January 2012 and September 2012.

Mean ± SD of age between case and control group wasn't significantly (P-Value≥0.05) different. This means that population of study was divided into case and control group equally. About gestational age between case and control group there was no significant difference (P-Value≥0.05).

Mean ± SD of APGAR scores in first and 5th minutes had significant difference (P-Value≤0.05). These scores were less in case group than control group and the results agree with Lotfalizadeh *et al*. [16] who reported that case group is high risk women who are diagnosed by positive Biophysical Profile or OCT or non-reactive Non Stress Test (NST). Ahmadpour *et al*. [17] designed a prospective study in Babol, Iran in which pregnant women are divided into high and low risk groups according to risk factors of pregnancy. Van Laar *et al*. [11] in the Netherlands compared between neonates with and without acidosis. In Wiberg-Itzel study [7] which was done in Sweden also there was not significant different (P-Value≥0.05) between high and low risk groups.

In our study, there were no significant differences (P-Value≥0.05) between Gestational Diabetes Mellitus (GDM), Overt Diabetes Mellitus, Hypothyroidism and Pregnancy Induced Hypertension (PIH) incidence. This means that according to this study these disorders were not the causes of fetal distress. Our results are against some other studies like a survey which was done on 440 pregnant women in Saudi Arabia. Sahu *et al*. [18] investigated 633 pregnant women in India and concluded that hypothyroidism is able to cause fetal abnormal growing and distress of neonates at birth. Spinato *et al*. [19] also performed a study in which PIH was determined as one of the risk factors of fetal distress.

According to patterns of fetal heart monitoring, acceleration and late deceleration were significantly more in case group. These results are similar to Martin *et al*. [20] in France.

In this study there was a significant difference between groups for NICU admission.

Mean ± SD of PH, PCO2 and Base Deficit was not significantly different between groups. There was a controversy between studies. Rafati *et al*. [21] found that there is no relation between type of delivery (NVD or Cesarean) and umbilical cord blood gas [21]. Ahmadpour *et al*. [17] reported that there is not a significant relation between APGAR scores in first and 5th minutes and arterial pH of umbilical cord. Kaveh *et al*. [22] concluded that arterial pH of neonates at birth are significantly different between high risk and low risk group. Lotfalizadeh *et al*. [16] concluded that there is a significant relation between NST test and acidosis. There was also a relation between Biophysical Profile and acidosis in Valadan *et al*. study [23].

According to our data, baseline disorders of mothers including hypothyroidism, PIH, Overt DM and GDM has not relation with fetal distress. Beside this we concluded that PH, PCO2 and Base Deficit of umbilical cord are not a precise predictive factor for fetal distress. In our survey, there was a significant difference between groups in first and 5th minutes Apgar score. Birth weight of neonates was not a diagnostic factor for predicting perinatal fetal distress.

REFERENCES

1. Abeer Eswi and Amal Khalil, 2012. Prenatal Attachment and Fetal Health Locus of Control among Low Risk and High Risk Pregnant Women. World Applied Sciences Journal, 18(4): 462-471.
2. Pourjafar, M., K. Badiei, A.A. Chalmeh, A.R. Sanati, M.H. Bagheri, M. Badkobeh and A. Shahbazi, 2011. Cardiac Arrhythmias in Clinically Healthy Newborn Iranian Fat-Tailed Lambs. Global Veterinaria, 6(2): 185-189.
3. Ravenswaaij-Arts, C.M., L.A. Kollée, J.C. Hopman, G.B. Stoelinga and H.P. Van Geijn, 1993. Heart rate variability. Ann Intern Med., 118(6): 436-47. Review.
4. Vintzileos, A.M., D.J. Nochimson, A. Antsaklis, I. Varvarigos, E.R. Guzman and R.A. Knuppel, 1995. Comparison of intrapartum electronic fetal heart rate monitoring versus intermittent auscultation in detecting fetal acidemia at birth. Am. J. Obstet. Gynecol., 173(4): 1021-4.
5. Ingemarsson, I., E. Ingemarsson and J.A.D. Spencer, 1993. Fetal heart rate monitoring. A practical guide. Oxford: Oxford University press.
6. National collaborating center for womens and childrens health.intrapartum care, 2007. Care of healthy women and their babies during childbirth. clinical guideline. London: RCOG press.
7. Wiberg-Itzel, E., C. Lipponer, M. Norman, A. Herbst, D. Prebensen and A. Hansson, 2008. Determination of pH or lactate in fetal scalp blood in management of intrapartum fetal distress: randomized controlled multicentre trial. BMJ, 336(7656): 1284-7.
8. Saling, E., 1981. Fetal scalp blood analysis. J Perinat Med., 9(4): 165-77.
9. Malin, G.L., R.K. Morris and K.S. Khan, 2010. Strength of association between umbilical cord pH and perinatal and long term outcomes: systematic review and meta-analysis. BMJ., 340:c1471. Review.
10. Ghosh, B., S. Mittal, S. Kumar and V. Dadhwal, 2003. Prediction of perinatal asphyxia with nucleated red blood cells in cord blood of newborns. Int. J. Gynaecol. Obstet., 81(3): 267-71.

11. Tong, S., V. Egan, J. Griffin and E.M. Wallace, 2002. Cord blood sampling at delivery: do we need to always collect from both vessels? BJOG., 109(10): 1175-7.
12. Umme Salma, Dabao Xu and M.D. Sayed Ali Sheikh, 2011. Diagnosis and Treatment of Intrauterine Adhesion. World Journal of Medical Sciences, 6(2): 46-53.
13. Sarnat, H.B. and M.S. Sarnat, 1976. Neonatal encephalopathy following fetal distress. A clinical and electroencephalographic study. Arch Neurol, 33(10): 696-705.
14. Nelson, K.B., 1988. What proportion of cerebral palsy is related to birth asphyxia? J. Pediatr., 112(4): 572-4.
15. Schifrin, B.S. and S. Ater, 2006. Fetal hypoxic and ischemic injuries. Curr Opin Obstet Gynecol., 18(2): 112-22. Review.
16. Lotfalizadeh, M., A. Mohammadzadeh, N. Ghomian, E. Kashani and S. Ghorbani, 2008. Journal of Hormozgan Mrdical University., 12(2): 121-6. [Persian]
17. Ahmadpour-Kacho, M., N. Asnafi, M. Javadian, M. Hajiahmadi and N. Taleghani, 2010. Correlation between Umbilical Cord pH and Apgar Score in High-Risk Pregnancy. Iran J Pediatr., 20(4): 401-6.
18. Sahu, M.T., V. Das, S. Mittal, A. Agarwal and M. Sahu, 2009. Overt and subclinical thyroid dysfunction among Indian pregnant women and its effect on maternal and fetal outcome. Arch Gynecol. Obstet., 281(2): 215-20.
19. Spinnato, J.A., B.M. Sibai and G.D. Anderson, 1986. Fetal distress after hydralazine therapy for severe pregnancy-induced hypertension. South Med. J., 79(5): 559-62.
20. Martin, A., 2008. [Fetal heart rate during labour: definitions and interpretation]. J. Gynecol Obstet Biol. Reprod (Paris), 37(1): S34-45. French.
21. Raafati, S.H., H. Borna, F. Haj Ebrahim Tehrani, M.R. Jalali nodoshan, M.H. Mozafari and M. Eslami, 2006. Neonatal apgar scores and umbilical blood gas changes in vaginal delivery and cesarean:a comparative study. Tehran University Medical Journal, 64(4): 61-8. [Persian]
22. Kaveh, M., F.T. Davari and M. Farahani, 2004. Apgar score and arterial blood gas in the first hour of birth in neonates. Journal of pediatric Disease., 14(1): 27-32. [Persian]
23. Valadan, M., M. Moridi, F. Davari Tanha, F. Rahimi Sher Baf and Z. Elahi Panah, 2009. Tehran University Medical Journal, 66(11): 826-30.