Research Article

Risk Factors Associated with Birth Asphyxia: A Case Control Study

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Abstract

Introduction: Birth asphyxia is a disturbance to the fetus or newborn due to failure to breath or breathing poorly, leads to decrease oxygen perfusion to various organs. Many neonatal deaths occurred each year due to birth asphyxia.

Objective: The objective of this study was to determine the risk factor associated with birth asphyxia.

Methods: This Case-Control study was conducted at department of Obstetrics and Gynecology Sir Gangaram Hospital, Lahore. The study was completed in 9 months after approval of synopsis. A total of 154 cases and 154 controls were taken in this study. All new born baby (age < 2 days), having any mod of delivery (vaginal or cesarean section (C-section) and baby born at gestational age (28-41weeks) were included. New born with any anomaly, mother with previous history of birth asphyxia and twins were excluded from study. After taking consent form, data collection divides into three factor sections i.e.: maternal, intrapartum and neonatal sections. After taking consent form, data collection divides into three factor sections i.e.: maternal, intrapartum and neonatal sections. Data was entered and analyzed by SPSS version 24.0 Mean + SD was calculated for quantitative data. Frequency and percentage was calculated for categorical data. Chi-square test was applied for categorical data. Independent sample T-test/ Mann Whitney u test was applied. Odds ratio also be calculated. Logistic Regression was applied to confirm possible risk factors. P value ≤ 0.05 was considered as significant.

Results: The mean age of mothers in cases was 29.66 ± 5.20 years and in control groups was 25.29 ± 3.95 years, the mean of mothers was statistically higher in cases than controls, p-value <0.001. The mean gestational age of mothers in cases was 37.34 ± 1.37 weeks and in controls was 38.01 ± 0.91 weeks respectively, the mean gestational age was statistically lower in cases as compared to control, p-value < 0.001. It is concluded that the risk factors for birth asphyxia are found as Father's education (AOR = 4.59), Oligohydramnios (AOR = 5.29), Preterm (AOR = 4.24), Gravida (AOR = 3.33), Breech position (AOR = 3.13), gestational diabetes mellitus (AOR = 3.11), ANC (AOR = 2.71), pregnancy induced Hypertension (AOR = 2.61), and maternal age (AOR = 1.28).

Conclusion: It is concluded that there are many factors associated with birth asphyxia that can be managed during pregnancy or immediately before delivery. By controlling such factors, risk of birth asphyxia can be controlled, by reducing birth asphyxia we can reduce neonatal mortality.

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Key words: Birth asphyxia, maternal factor, fetal factors, neonatal mortality

Introduction

Birth asphyxia is described as initiating, maintaining, and sustaining breathing at birth. It can also be characterized as deficiency of the exchange of the placental or pulmonary gas contributing to hypoxemia and hypercarbia[1]. During birth, oxygen deprivation which cause birth asphyxia and inflict severe hypoxic organ injury (heart, lungs, liver, stomach, kidneys), neurodegenerative diseases, mental retardation and epilepsies[2,3]. The brain organ is most affected by birth asphyxia and its recovery time is greater than other organs[4].

New born babies after organ damage live in severe situation but in case of brain injury, it affects not only physical such as spasticity also psychological like learning disorder, development of schizophrenia, attention deficits, hyperactivity and life-long functional psychotic syndromes[5]. There are many different methods of identification of Birth asphyxia. When an infant has a value of <7 Apgar it identified as Birth asphyxia[6]. Other way to detection of Birth asphyxia by test umbilical cord plasma acidity. If the result shows too acidic that indicate the infarct has had deficiency time of oxygen[7]. There are many symptoms among infant with Birth asphyxia i.e: breathe weakly, low pulse rate, may have bluish to very light skin, may have seizures a couple of hours after conception or impaired muscle tone[8,9]. Asphyxia followed by re-oxygenation can potentially lead to development of several neurodegenerative pathologies, diabetes type 2 and cancer. Early recognition and management of its contributing factors would modify the problem[10].

According to World Health Organization (WHO), around the world between 4 to 9 million newborn per year reported birth asphyxia which include global neonatal mortality are 29%[11]. Birth asphyxia caused 1.2 million deaths which as same number of infant having with serious complications, such as autism, cerebral palsy and decline in development[12].

During antepartum or antepartum and include fetal causes incidents can be triggered the Birth asphyxia. Some other factors which contributed correlated with birth asphyxia breech appearance, mild to heavy meconium-stained amniotic fluid ,birth weight < 2500 g, morphine or pethidine intrapartum sedation and premature childbirth[13].

Among low and middle-income economies, neonatal death rate is highly reported which have half occur at home deliveries. In neonatal mortality rate, Pakistan ranks 5th worldwide in the list. Birth asphyxia is the main cause of infant deaths arises in rural areas (74%) which contribute 40% of Pakistan's neonatal mortality burden[14]. By providing a sufficient number of supplies take place at home in the developing world, there is no proper statistic to correctly quantify the disease burden in countries like Pakistan. In Pakistan, more than 5 million children are born yearly. Among 5 million children, 0.45 million of them expire before the first birthday and about half of these deaths occur during the neonatal period[15].

Developing effective interventions capable to identify the risk factors in birth asphyxia requires a detailed knowledge of conditions, risk factors predisposing to decline and collaborative efforts by individuals, the community and doctors. Such studies are required to be done in Pakistan to improve birth asphyxia patients and to improve healthcare outcome.' The objective of this study was determining the risk factors associated with birth asphyxia.

Methods:

This case-control study was conducted at Sir Ganga Ram Hospital, Lahore. The study was done in 6 months after approval of synopsis [May 2018 till Oct 2018] using non-probability convenient sampling. A total of 308 sample including 154 cases and 154 controls was taken in this study, the sample size is estimated using P1 (Breech presentation) in study group is 9.40%[11], P2 (Breech presentation) in study group is 2.67%[11] with 95% confidence level and 80% power of test using:

In inclusion criteria, New born baby (age < 2 days), any mode of delivery (vaginal or cesarean section (C-section), baby born at gestational age (28-41weeks) for this study. New born with any anomaly, mother with previous history of birth asphyxia, and twins were not excluded. After taking consent form, data collection divides into three factor sections i.e.: maternal, intrapartum and neonatal sections. Data was entered and analyzed by SPSS version 24.0 Mean + SD was calculated for quantitative data. Frequency and percentage was

calculated for categorical data. Chi-square test was applied for categorical data. Independent sample T-test/ Mann Whitney u test was applied. Odds ratio also be calculated. Logistic Regression was applied to confirm possible risk factors. P value ≤ 0.05 was considered as significant.

Results:

The mean age of mothers in cases was 29.66 ± 5.20 years and in control groups was 25.29 ± 3.95 years, the mean of mothers was statistically higher in cases than controls, p-value <0.001. The mean gestational age of mothers in cases was 37.34 ± 1.37 weeks and in controls was 38.01 ± 0.91 weeks respectively, the mean gestational age was statistically lower in cases as compared to control, p-value < 0.001. (Table -1)

asphyxia for females having pregnancy induced hypertension i.e. OR= 4.630 (2.861-7.493). In case group there were 60(39%) females who had gestational diabetes while in controls there were 12(7.8%) females who had pregnancy induced hypertension. There was significant association of birth asphyxia with pregnancy induced hypertension and there was 7.55 times higher chances of birth asphyxia for females having pregnancy induced hypertension i.e. OR= 7.553 (3.856-0.14.796).

In case and control group there were 58(37.7%) fetus and 16(10.4%) fetus had breech presentation having significant association with breech presentation, p-value < 0.05 and there were 5.211 times higher chances of birth asphyxia for fetus having breech position i.e. OR= 5.211 (2.827-9.607).

Table-1: *Mean comparison of maternal age (years) and gestational age (weeks) in both study groups*

	Study Group	Mean	S.D	t-test	P-value
Maternal age (years)	Case	29.66	5.20	8.286	<0.001**
	Control	25.29	3.95		
Gestational (weeks)	Case	37.34	1.37	-4.986	<0.001**
	Control	38.01	0.91		

**Highly Significant

Among cases there were 77(50%) females who had primigravida and 77(50%) females were multigravida while in control group there were 56(36.4%) females who were primi gravida and 98(63.6%) females were multi gravida. There was significant association of birth asphyxia with primigravida, p-value < 0.05, moreover there was 1.75 times more chances of birth asphyxia in primigravida females i.e. OR= 1.750 (1.110-2.760).

Among cases there were 83(53.9%) females who had < 4 antenatal visits and among control group there were 44(28.6%) mothers had < 4 antenatal visits. There was significant association of birth asphyxia with ANC visit <4, p-value < 0.05, moreover there were 2.923 times more chances of birth asphyxia in females having ANC visits < 4 i.e. OR= 2.923 (1.823-4.685).

In case group there were 100(64.9%) females who had pregnancy induced hypertension, while in controls there were 44(28.6%) females who had pregnancy induced hypertension. There was significant association of birth asphyxia with pregnancy induced hypertension and there was 4.63 times higher chances of birth

In case group Chorioamnionitis was seen in 28(18.2%) females and 11(7.1%) of control group, having significant association with birth asphyxia, p-value < 0.05 and there were 2.880 times higher chances of birth asphyxia for Chorioamnionitis i.e. OR= 2.889 (1.382-6.039).

Oligohydramnios was seen in 31(20.1%) cases and 9(5.8%) controls with significant association with birth asphyxia, while there were 4.06 higher chances of birth asphyxia for Oligohydramnios i.e. OR= 4.061 (1.861-8.858).

Premature rupture of membrane (PROM) >18 hours was seen in 37(24%) cases while in controls no female had PROM > 18 hours, there were significant association with birth asphyxia with PROM >18 hours, while there were 2.316 higher chances of birth asphyxia for those who had PROM >18 hours i.e. OR= 2.316 (2.021-2.655).There were 15(9.7%) females who needed sedation in cases and 4(2.6%) females needed in controls, there was significant association of birth asphyxia with sedation, p-value < 0.05 with 4.047

Table-2: *Comparison of different factors in both study groups*

Factors		Case group (n=154)	Control group (n=154)	OR	(95% CI)	p-value*
1.Gravida	Primigravidarum	77(50%)	56(36.4%)	1.750	(1.110-2.760)	0.016
	Multigravida	77(50%)	98(63.6%)			
2.Antenatal check-ups < 4 visits	Yes (N%)	83(53.9%)	44(28.6%)	2.923	1.823-4.685)	0.001
	No (N%)	71(46.1%)	110(71.4%)			
3.Pregnancy induced Hypertension	Yes (N%)	100(64.9%)	44(28.6%)	4.630	(2.861-7.493)	0.001
	No (N%)	54(35.1%)	110(71.4%)			
4.Gestational Diabetes mellitus	Yes (N%)	60(39%)	12(7.8%)	7.553	(3.856-0.14796)	0.001
	No (N%)	94(61%)	142(92.2%)			
5.Breech presentation	Yes (N%)	58(37.7%)	16(10.4%)	5.211	(2.827-9.607)	0.001
	No (N%)	96(62.3%)	138(89.6%)			
6.ChorioamnionitIs	Yes (N%)	28(18.2%)	11(7.1%)	2.889	(1.382-6.039)	0.004
	No (N%)	126(81.8%)	143(92.9%)			
7.Oligohydramnios	Yes (N%)	31(20.1%)	9(5.8%)	4.061	(1.861-8.858)	0.001
	No (N%)	123(79.9%)	145(94.2%)			
8.*PROM > 18 hours*	Yes (N%)	37(24%)	0(0%)	2.316	(2.021-2.655)	0.001
	No (N%)	117(76%)	154(100%)			
9. *Sedation*	Yes (N%)	15(9.7%)	4(2.6%)	4.047	(1.311-12.488)	0.009
	No (N%)	139(90.3%)	150(97.4%)			
10.Vacuum or Forceps extraction	Yes (N%)	65(42.2%)	40(26%)	2.081	(1.286-3.369)	0.003
	No (N%)	89(57.8%)	114(74%)			
11. IUGR	Yes (N%)	44(28.6%)	4(2.6%)	15.00	(5.235-42.981)	0.001
	No (N%)	110(71.4%)	150(97.4%)			
12.Fetal distress	Yes (N%)	53(34.4%)	10(6.5%)	7.556	(3.671-15.556)	0.001
	No (N%)	101(65.6%)	144(93.5%)			
13.Cesarean section	Yes (N%)	103(66.9%)	48(31.2%)	4.460	(2.764-7.196)	0.001
	No (N%)	51(33.1%)	106(68.8%)			
14.Preterm delivery	Yes (N%)	66(42.9%)	16(10.4%)	6.469	(3.521-11.883)	0.001
	No (N%)	88(57.1%)	138(89.6%)			
15. Sex of child	Male	73(47.4%)	82(53.2%)	0.791	(0.791-1.238)	0.305
	Female	81(52.6%)	72(46.8%)			
16.Birth weight (grams)	< 2,500	71(46.1%)	26(16.9%)	4.211	(2.485-7.136)	0.001
	≥2500	83(53.9%)	128(83.1%)			

*P value ≤ 0.05 was considered as significant.

higher chance i.e. OR= 4.047 (1.311-12.488). In cases there were 65(42.2%) babies who needed Vacuum or forceps extraction and in controls 40(26%) babies needed Vacuum or forceps extraction. There significant association of birth asphyxia and Vacuum or forceps extraction with higher odds i.e. OR= 2.081 (1.286-3.369).

In cases and controls there were 44(28.6%) babies and 4(2.6%) babies who had IUGR, there was significant association of birth asphyxia with IUGR, p-value < 0.05 and there were 15 times higher chances of birth asphyxia with IUGR i.e. OR= 15.00 (5.235-42.981).

Fetal distress was noted in 53(34.4%) cases and 10(6.5%) controls and there was significant association birth asphyxia with fetal distress, p-value < 0.05, with 7.556 higher chances of birth asphyxia with fetal distress, OR= 7.556 (3.671-15.556). Fetal distress was noted in 53(34.4%) cases and 10(6.5%) controls and there was significant association birth asphyxia with fetal distress, p-value < 0.05, with 7.556 higher chances of birth asphyxia with fetal distress, OR= 7.556 (3.671-15.556).

Birth asphyxia was also found to be associated with C-section, 103(66.9%) neonates in cases and 48(31.2%) neonates in control born through C-section, p-value <

0.05 and there were 4.460 times higher chances of birth asphyxia i.e. OR= 4.460 (2.764-7.196).

Among cases and controls there were 66(42.9%) and 6(10.4%) preterm births, there was significant association of birth asphyxia with preterm birth and there were 6.469 times higher chance of birth asphyxia for preterm babies, OR= 6.469 (3.521-11.883).

There was no significant association of birth asphyxia with sex of child, as in cases there were 73(47.4%) male and 81(52.6%) female cases and among controls there were 82(53.2%) male and 72(46.8%) female cases, p-value > 0.05.

Among cases and controls there were 71(46.1%) and 26(16.9%) neonates who had low birth weight, there was significant association of birth asphyxia with low birth weight and there were 4.211 times higher chance of birth asphyxia for low birth weight, OR= 4.211 (2.485-7.136). (Table -2)

It is concluded that the risk factors for birth asphyxia are found as Father's education (AOR = 4.59), Oligohydramnios (AOR = 5.29), Preterm (AOR = 4.24), Gravida (AOR = 3.33), Breech position (AOR = 3.13), gesta-tional diabetes mellitus (AOR = 3.11), ANC (AOR = 2.71), pregnancy induced Hypertension (AOR = 2.61), and maternal age (AOR = 1.28). (Table -3)

group. Same results were reported in similar studies[8,9,11]. In Preterm babies, Infants have a lot of different morbidities especially respiratory distress syndrome in lung system. Therefore, it is necessary to early diagnosis it to provide proper management to prevent preterm delivery.

In previous studies, they have reported other risks factor i.e.: chorioamnionitis, oligohydramnios, route of delivery, PROM longer than 18 hours, IUGR, fetal distress and twins[7,8,11-15]. But in this study, they did not influence the incidence of birth asphyxia. This is explaining the effect of sample size of current study compare to other studies population which showed negative correlation of these factors.

In current study the mean age of mothers in cases was 29.66 ± 5.20 years and in in control groups was 25.29 ± 3.95 years, the mean of mothers was statistically higher in cases than controls, p-value <0.001. Aslam et al. reported that maternal age in cases was 24.22 ± 3.38 and in control group was 24.30 ± 4.04 years. 6 In current study the mean gestational age of mothers in cases was 37.34 ± 1.37 weeks and in controls was 38.01 ± 0.91 weeks respectively, the mean gestational age was statistically lower in cases as compared to control, p-value < 0.001. The common factors found for birth asphyxia were father's education (AOR = 4.59), Oligo-

TABLE-3: *Final logistic regression*

	β	Df	p-value	Adjusted Odds ratio	95.0% C.I. for EXP(B)	
					Lower	Upper
Maternal age	0.245	1	<0.001	1.28	1.168	1.397
Father's education	1.667	1	<0.001	5.29	2.090	13.413
Gravida	1.203	1	.005	3.33	1.434	7.740
ANC <4 visits	0.998	1	.007	2.71	1.319	5.584
Pregnancy induced Hypertension	0.960	1	.007	2.61	1.294	5.275
Gestational Diabetes mellitus	1.135	1	.016	3.11	1.234	7.854
Breech position	1.141	1	.016	3.13	1.242	7.883
Oligohydramnios	1.525	1	.004	4.59	1.635	12.901
Preterm birth	1.445	1	<0.001	4.24	1.980	9.079
Constant	1.755	1	.764	5.78		

Discussion:

The study objective was to determine the risk factor associated with birth asphyxia. In current study preterm delivery was 6.46 times that of the control

hydramnios (AOR = 5.29), Preterm (AOR = 4.24), Gravida (AOR = 3.33), Breech position (AOR = 3.13), gestational diabetes mellitus (AOR = 3.11), ANC (AOR = 2.71), pregnancy induced Hypertension (AOR = 2.61), and maternal age (AOR = 1.28).

A recent study was reported the significant antepartum risk factors were mother age 20 to 25, prim-gravidity and pre-eclampsia. In intrapartum, significant risk factors were maternal fever, delivery at home, and breech presentation. For baby risk factor fetal distress, baby weight, child's resuscitation were reported[16]. Another study reported associated significantly factors were meconium-stained amniotic fluid, low birth weight, chronic hypertension and anemia during pregnancy[17].

In General hospitals of Tigray, Ethiopia, a cross-sectional study was reported the prevalence and factors associated with perinatal asphyxia among neonates. They reported that neonates born with cesarean section are seven times more likely to have perinatal asphyxia than those who are born spontaneously through the vagina (AOR, 6.97; CI (2.87-16.93)). In addition, neonates who are born meconium stained are 8.55 times more likely to have perinatal asphyxia than those who had not stained with meconium (AOR, 8.55; CI (4.20-17.39). Neonates who are weighed less than 2.5 kg are 12.75 times more likely to have perinatal asphyxia than those who are weighed 2.5-4 kg (AOR, 12.75; CI (4.05-40.08)). Prolonged duration of labour was also associated statistically with perinatal asphyxia (AOR, 3.33, CI (1.32-8.38)) .18 Woday et al. conducted a cross-sectional study to assess the prevalence and associated factors of birth asphyxia among newborns in public hospitals in the northeastern Amhara region, Ethiopia. The prevalence of birth asphyxia was found to occur 22.6% of the time [95% CI 19.2% - 26.4%] in the first minute of birth. In the multivariable logistic regression being primipara [AOR = 3.77: 95% CI 1.86, 7.65], presented with complicated labor [AOR = 3.45: 95% CI 1.58, 7.49], premature rupture of membrane [AOR = 3.85: 95% CI 1.76, 8.44) and having blood-stained amniotic fluid at birth [AOR = 5.02: 95% CI 1.69, 14.87] were the independent predictors of birth asphyxia[19].

Conclusion:

It is concluded that there are many factors associated with birth asphyxia that can be managed during pregnancy or immediately before delivery. By controlling such factors, risk of birth asphyxia can be controlled, by reducing birth asphyxia we can reduce neonatal mortality.

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