Original Article

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Relationship Between Mode of Delivery and Rate of Birth Asphyxia in a Tertiary Care Hospital, Rawalpindi; A Case-Control Study

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ABSTRACT

Objective: To assess the relationship between mode of delivery and rate of birth asphyxia in a Tertiary care Hospital, Rawalpindi.

Methodology: This prospective case control study was conducted in Holy family Hospital, Rawalpindi from August 2021 to December 2021. One hundred and seventy-two newborns were enrolled after assessing the inclusion criteria and divided equally into cases (neonates with birth asphyxia) and controls (neonates without birth asphyxia). A structured performa was designed to take detailed history of mode of delivery and severity of birth asphyxia by using APGAR score. Data analysis was done using SPSS 24.00.

Results: One hundred and seventy-two neonates were included in the study. 110 were males (63.9%) and 62 were females (36%). Term infants were more affected with birth asphyxia rather than preterm infants (53.6%). Meconium stained liquor(61.9%) and non-booked cases(55.1%) were seen more in case group. Spontaneous vaginal delivery was the common mode among all in our study population(91%). Emergency caesarean sections have higher frequency of birth asphyxia as compared to elective caesarean sections (39.3%) but no statistically significant difference found in frequency of birth asphyxia between case and control groups with regards to mode of delivery (p value=0.620) but significant in terms of neonatal mortality (p value=0.000).

Conclusion: Birth asphyxia is a common contributor to neonatal mortality and improving perinatal care can help in reducing neonatal morbidity and mortality in developing countries.

Keywords: Birth asphyxia, mode of delivery, neonatal mortality, APGAR score

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Introduction

Birth asphyxia is defined as the failure to establish breathing at birth.[1] Neonates with ineffective and gasping breathing within 1 minute after birth is also considered as birth asphyxia.[2] Birth asphyxia still continues to be a major disease burden and one of the commonest challenges faced by health experts worldwide[3,4] as 4 million neonates suffers from asphyxia each year worldwide and being the major cause of neonatal morbidity and mortality in developing part of the world. 3.45 percent of Under-five year mortality occur in neonatal period and about one fourth of neonatal mortality are caused by perinatal asphyxia globally.[5] Pakistan comes fifth on the list of countries having highest neonatal mortality rate worldwide. The reason being birth asphyxia in 40% of these cases.[6] Those who survive this perinatal insult may suffer neurological sequelae including cerebral palsy, epilepsy and developmental delay.[7]

According to study conducted in Canada, the incidence of birth asphyxia has decreased drastically (by 95%) during

the study period nationally[8] but its incidence is ten times higher in developing countries, as in these countries there is lack of adequate resources for neonatal as well as maternal care.[9] The incidence of birth asphyxia is significantly related to the mode of delivery and it is found highest in vaginal breech delivery followed by forceps and then spontaneous vaginal delivery[10] but according to study conducted at Tampere University Hospital, Finland, Increased cesarean rate from 6.8 to 11.3% during this study period, had no impact on short-term outcome in neonates.[11] Furthermore, a study conducted in mainland China in 2011 says that in 81% of all first child antepartum deliveries, non-indicated Cesarean sections had similar short-term perinatal outcomes as in spontaneous vaginal deliveries.[12]

According to study conducted in Ethiopia, newborns delivered via vacuum have four folds increased rate of birth asphyxia and forceps delivered have five times risk of developing asphyxia than vaginal and C-section births.[3] According to a study done in Civil Hospital Karachi, 62.6% of birth asphyxia cases were normal vaginal deliveries, 16.2% were delivered via C-section, 21.1% were operated vaginal deliveries. Furthermore, Deliveries conducted by midwives were significantly related to frequency of birth asphyxia.[13]

There is limited research work done on this subject in our resource limit settings and we also aimed to help in reducing neonatal morbidity and mortality by addressing and emphasizing good perinatal care. As birth asphyxia is a major contributor in neonatal mortality and in severe cases, children may suffer from adverse neurological complications.

Methodology

An unmatched prospective case-control study was carried out on neonates delivered from August 2021 to December 2021 at Holy Family Hospital, Rawalpindi. All live term and preterm neonates were assessed for the eligibility for this study. Neonates with congenital anomalies, syndromes, congenital infections, hydrops fetalis and neonates requiring surgical interventions were excluded from the study. Neonates with APGAR score of < 7 at 5minutes were labelled as a case of birth asphyxia[14] whereas neonates with APGAR of > and equal to 7 at 5 minutes were taken as controls i.e. without birth asphyxia. Birth asphyxia was categorized further into mild, moderate and severe according to APGAR score of 6, 4-5 and 0-3. The sample size of 172 neonates was calculated using OpenEpi, version 3, open source calculator with 80% power of study, ratio of controls to cases 2:1, 95% confidence interval, odds ratio of 3.58, percentage of controls with risk factor i-e Cesarean section is 8.35%, and percentage of cases with the risk factor is 37.8%.[15] After getting approval from Institutional Review Board, Rawalpindi Medical University/ Holy Family Hospital,172 neonates were recruited and 86 were divided in case and control group each.

A structured performa was designed to take detailed antenatal, natal and postal history of neonates fulfilling the inclusion criteria, got admitted in neonatal intensive care unit during this study period. According to APGAR scoring at 5 minutes, neonates were divided into case and control group. Data on antenatal history of booked or non-booked cases were obtained. Detailed history of birth was taken which included place, mode and gestation at delivery. Liquor color was also taken into account. Neonatal factors including birth weight, gender and outcome of admission were noted.

Data analysis was done using SPSS 24. Descriptive statistics such as frequencies, percentages and means with standard deviation were used to explain antenatal, natal and postnatal factors. Chi-square test was used for bivariate analysis of relationship between birth asphyxia and independent variables and P value of ≤ 0.05 was taken as significant.

Results

Study was conducted on 172 newborns after applying excluding criteria and both case and control group contains 86 each. Among 172 newborns, 110 were males (63.9%) and remaining 62 were females (36%). Term infants were more affected with birth asphyxia rather than preterm infants(p value 0.05).Meconium stained liquor was seen in 13(61.9%) infants with birth asphyxia. There was no significant difference between the booked and non booked cases in their incidence of birth asphyxia (p value 0.17). Newborns with birth weight appropriate for gestation were found more in case group (n=68, 59.6%) as compared to small and large for gestation newborns with p-value of 0.002.

Majority of the newborns of study population were delivered in government hospitals n=133(77.3%). There was no significant difference in terms of the incidence of birth asphyxia when compared for the place of delivery (p value 0.36). Spontaneous vaginal delivery was the prevalent mode among all modes of deliveries during study period (52.9%) but no significant difference was found between the case and control groups for the

incidence of birth asphyxia (p value 0.574). There were equal numbers of patients born via emergency Cesarean section and the elective procedure, however the difference of birth asphyxia between the two groups was statistically insignificant (p value 0.326).

Severe birth asphyxia was present in 6.4% cases, moderate asphyxia was found in 21.5% and mild asphyxia was present in 22.1% cases. Fewer newborns who suffered asphyxia were discharged as compared to controls (38.2%). There was significant number of asphyxia cases who expired and left against medical advice as compared to controls. (p-value 0.001)

Discussion

Asphyxia is the chief cause of neonatal mortality due to hypoxic-ischemic insult. Perinatal care is an important step in reducing neonatal mortality and preventing long term sequelae.[15] Majority of the risk factors of birth asphyxia are antenatal and postnatal events. Our study was conducted to see the impact of mode of delivery on frequency of birth asphyxia as perinatal factors are major determinants of birth asphyxia.[16]

Our study was conducted on 172 newborns to see the relationship between mode of delivery and frequency of birth asphyxia and there is no statistical significance found between them (p value=0.620) reported similarly in case control study conducted in Iran which concluded that there is no statistical significance between delivery mode and rate of birth asphyxia (p value=0.993).[4] However, study conducted by Hou et al[12] showed that antepartum non-indicated cesarean section was associated with lower chances of 5-minute APGAR less than 4 (aOR = 0.06, CI = 0.10–0.36) as compared to spontaneous vaginal delivery but not associated significantly with changes in frequency of hypoxic ischemic encephalopathy (HIEE), infections or meconium aspiration. Similarly, study done by Desalew et al[16] found that newborns delivered via cesarean sections had four times more chance of having birth asphyxia than those delivered via spontaneous vaginal deliveries(AOR; 3.66 [95% CI: 1.35-9.91]) and similarly preterm deliveries have 3 times higher risk of suffering birth asphyxia than term infants (AOR; 3.98, 95% CI: 3.00-5.29).

Our results showed statistical significant relation of neonatal mortality and birth asphyxia in our study population (p-value=0.000) found similarly in study done in Ethiopia,2019 which showed that neonates with asphyxia had 3.9 times risk of mortality as compared to controls (AOR; 3.9 [95% CI= 1.3-7.3]).[17] Furthermore, our results showed significant relationship between appropriate for gestational age and frequency of birth asphyxia (p value=0.002) which is contrary to results seen in study conducted by Tasew et al[5] in Ethiopia 2018, which showed that lower birth weight newborns were 6.9 times more at risk for birth asphyxia as compared to control group.

Our study had certain limitations as it was a single hospital-based study and birth asphyxia is a prevalent cause of neonatal morbidity and mortality in neonates so larger sample size and multi-center study will be more helpful in getting more conclusive results. Moreover, our study used apgar score to define birth asphyxia and alone

Table I: Prevalence of variables among case and control group. (n=86)

Variable			Cases Number (%)	Controls Number (%)	P-Value
Antenatal Care	Booked		37(44.6)	46(55.4)	0.170
	Non-booked		49(55.1)	40(44.9)	
Mode of delivery	Vaginal	Spontaneous	47(51.6)	44(48.4)	0.574
		Assisted	13(56.5)	10(43.5)	
	Cesarean	Elective	11(39.3)	17(60.7)	0.326
		Emergency	15(50.0)	15(50.0)	
Place of delivery	Government Hospital (n 133)		64(48.1)	69(51.9)	0.363
	Private Hospital (n 39)		22(56.4)	17(43.6)	
Colour of Liqour	Clear		73(43.8)	78(57.1)	0.244
	Meconium stained		13(61.9)	8(38.1)	
Gender	Male		57(51.8)	53(48.2)	0.525
	Female		29(46.8)	33(53.2)	
Gestation	Term		75(53.6)	65(46.4)	0.050
	Preterm		11(34.4)	21(65.6)	
Birth Weight	Appropriate for gestation		68(59.6)	46(40.4)	0.002
	Small for gestation		14(33.3)	28(66.7)	
	Large for gestation		4(25)	12(75)	
Outcome	Discharged		39(38.2)	63(61.8)	0.001
	LAMA		9(64.3)	5(35.7)	
	Expired		38(67.9)	18(32.1)	

apgar score would be inappropriate in interpreting cases of birth asphyxia.

Conclusion

Birth asphyxia is a major contributor to neonatal mortality and antenatal components are mainly responsible for causing asphyxia in neonates. The current study is done to identify the relationship between mode of delivery and frequency of birth asphyxia which according to our result is not statistically significant, however there is significant relationship between neonatal mortality and birth asphyxia.

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