

Antenatal and perinatal predictors of hypoxic encephalopathy.

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Abstract

Approximately 20-30% of infants with HIE die in the neonatal period, and 33-50% of survivors are left with permanent neurodevelopmental abnormalities (cerebral palsy, mental retardation). Several epidemiologic studies have identified adverse sociodemographic factors, maternal conditions, antenatal and neonatal complications in association with HIE. To determine the antenatal factors and perinatal factors that are associated with increased risk of term neonatal Hypoxic-Ischemic Encephalopathy (HIE) in Al Zahraa teaching hospital. During a period between February and October 2019, a total 104 neonate enrolled in the study according to inclusion criteria. A study group contain 44 patient and control 60 neonate. Multiple demographic, antenatal and perinatal factors have been studied as a predictor of HIE. Regarding demographic characteristics of enrolled population we found rural residency increase the probability of HIE [odd ratio and 95% CI = 1.67 (1.2-2.34)]. In antepartum factors, we found that parity less than five and complication during pregnancy increase the probability of HIE.[odd ratio and 95% CI=3.58 (1.69-6.54) and 4.21 (1.68-0.54) respectively]. In intrapartum factors, we found vaginal delivery and complication during labour associated with higher risk of HIE. [Odd ratio and CI=2 (1.13- 3.54) and 9 (3.6-22.7) respectively].With regard to neonatal factors; low Apgar score. [Odd ratio and CI=for Apgar score at 1 min. 7.33 (3.5-15.4), for Apgar score at 5 min. 2.93 (1.94-4.42) and GA<37wks]. And need for advanced resuscitation were associated with higher risk of HIE [odd ratio and CI=3 (1.28-7)]. We conclude that neonate of pregnant women whose have rural residency and had been subjected to complications during her pregnancy have a higher probability to have HIE. Also a pregnant women who have vaginal delivery and subjected to complication during labor are more prone to get HIE in her baby. Neonates who were delivered in a gestational age less than 37 weeks and required advanced resuscitation measures have a higher probability to get HIE.

Keywords: Hypoxic ischemic encephalopathy, Risk factors, Neonates, Predictors, Antenatal, Perinatal.

Accepted on 20 August, 2021

Introduction

Birth asphyxia is defined by the World Health Organization as “the failure to initiate and sustain breathing at birth.” Birth asphyxia is more appropriately known as Hypoxic-Ischemic Encephalopathy (HIE), is characterized by clinical and laboratory evidence of acute or sub-acute brain injury due to asphyxia. Birth asphyxia causes 840,000 (23%) of all neonatal deaths worldwide. An estimated 1 million children who survive birth asphyxia live with chronic neurodevelopmental morbidities, including cerebral palsy, mental retardation, and learning disabilities [1]. The primary causes of this condition are systemic hypoxemia and/or reduced cerebral blood flow.

- Maternal hypoxia due to cardiac or respiratory diseases.
- Maternal hypotension due to acute blood loss, spinal anesthesia, or inferior vena cava syndrome.
- Uterine tetany caused by the administration of excessive oxytocin.
- premature separation of the placenta.
- Umbilical cord knobbing or compression.
- Placental insufficiency from toxemia or post maturity.

After birth, hypoxia may be caused by:

- Neonatal hypoxia due to severe cardiorespiratory diseases.

- Severe anemia (severe hemorrhage, hemolytic disease).
- Shock (septic or hemorrhagic).

To determine the antenatal and perinatal factors that are associated with increased risk of term neonatal Hypoxic-Ischemic Encephalopathy (HIE) in Al Zahraa teaching hospital.

Materials and Methods

This is a descriptive gross sectional study of infants >36 weeks gestation with HIE born at Al Zahraa teaching hospital for maternity and children between February and October-2019.

Neonatal hypoxic ischemic encephalopathy which defined as a clinical syndrome present from birth and characterized by difficulty initiating and/or maintaining respiration, altered consciousness, and abnormal tone and reflexes, with or without seizures.

Infants were excluded if there is any sign and symptom of metabolic disease, congenital deformity and early onset sepsis. Control infants were recruited from the postnatal wards. The only inclusion criteria were that the infants were regarded as normal at birth and were sent to the postnatal ward [2].

For control and study groups, data concerning demographic characteristics of the mother with her obstetric and past

medical history, natal history were collected and analyzed. These data include the followings maternal age, family history of neurological diseases. Maternal socioeconomic class: Employment, education level, rural/ urban residency. Maternal chronic diseases as: hypertension, thyroid disorders, autoimmune disease. Obstetric history: Parity, history of abortions and infertility treatment. Complications during pregnancy: pregnancy induced hypertension, respiratory or urinary tract infection, significant antepartum bleeding, an episode of reduced fetal movements as reported by the mother before labour. Intrapartum complications, mode of delivery, Apgar scores, resuscitation measures, Premature Rapture of Membrane (PROM), uterine rupture, placental abruption, cord prolapse, shoulder dystocia and failed instrumental delivery. Infant characteristics: Gestational Age (GA), gender and Body Weight (BW).

A statistical analysis was done to identify potential risk factors for each above mentioned parameter using SPSS (statistical package for social sciences) from IBM version 20. Using logistic regression to calculate Odds Ratios (ORs) and 95% Confidence Intervals (CIs).

Results and Discussion

According to our inclusion criteria, a 44 patients were included in the study and 60 neonate as control group. The study conducted in Al Zahraa teaching hospital for pediatrics and maternity in period between February and October 2019. Multiple antenatal and perinatal factors were assessed; also neonatal factors as shown in the Table 1 [3].

Table 1. Factors which can predict the occurrence of HIE.

Demographic data and History		Cases (n=44)	Controls (n=60)	OR (95% CI)
Maternal age < 35 yrs.		12	42	1.06 (0.81-1.39)
Maternal age ≥ 35 yrs.		32	18	0.8 (0.5-1.54)
Family history of seizure		14	16	1.28 (0.54-3.01)
Employment		12	25	0.525 (0.227-1.21)
Urban		23	12	0.38 (0.214-0.68)
Rural		21	48	1.67 (1.2-2.34)
Obstetric history				
Gravida	G<5	39	44	3.85 (1.69-6.54)
	G ≥ 5	5	16	0.33 (0.215-0.52)
Pervious history of miscarriage		4	6	0.9 (2.38-3.4)
History of infertility		3	4	1.02 (0.21-4.28)

Complications during pregnancy	36	31	4.21 (1.68-10.54)	
Mode of delivery	Vaginal	33	30	2 (1.13 - 3.54)
	C/S	11	30	0.66 (0.5-0.9)
Complication during labor	35	18	9 (3.6-22.7)	
Neonatal variables				
Advanced Resuscitation Measures	12	0	3 (1.28-7)	
Apgar score at 5 min ≤ 3	29	0	2.93 (1.94-4.42)	
Gestational age	37.2 ± 2	37.5 ± 0.65	0.85 (0.63-1.15)	
< 37 wk	3	0	1.07 (0.99-1.16)	
>40 wk	4	2	0.34 (0.6-1.97)	
Body weight (mean)	3.25 ± 0.6	3.17 ± 0.5	1.27 (0.65-2.5)	
Male	27	32	0.72 (0.32-1.58)	
Twin	4	2	2.9 (0.5-16.6)	

Approximately 20-30% of infants with HIE die in the neonatal period, and ≈33-50% of survivors are left with permanent neurodevelopmental abnormalities (cerebral palsy, mental retardation).(6)Several epidemiologic studies have identified adverse socio-demographic factors, maternal conditions, antenatal and perinatal complications in association with HIE. (7-9)

In our study; with regard to social and demographic characteristics they are not influencing the incidence of HIE except for residency in rural area which show a high probability of getting HIE [odd ratio and 95% CI=1.67 (1.2-2.34)]. This is may be attributed to poor antenatal care in that areas, paucity of well-equipped labor room and absence of well-trained neonatal resuscitation team [4].

In antepartum factors; we found that parity less than five and complication during pregnancy increase the probability of HIE [odd ratio and 95% CI=3.58 (1.69-6.54) and 4.21 (1.68-10.54(respectively]. They found that primi parity was associated with higher probability of HIE.

In intrapartum factors; we found vaginal delivery are associated with higher risk of HIE. This is may be attributed to lack of fetal monitoring such as cardiotocogram and fetal scalp gas analysis, also in our center we do not use assisted vaginal delivery such as forceps and ventous delivery. Badawi et al(9) found that emergency caesarian section carry a higher risk of HIE than vaginal delivery. However, they show that elective caesarian section add no more risk for HIE than vaginal delivery [odd ratio=0.17].

Low Apgar score at 1 a 5 minute was a significant predictor of HIE [odd ratio and CI [7.33 (3.5-15.4) and 2.93 (1.94-4.42)] respectively. This is a well-known fact that is considered as

apart for definition of HIE. (Need for more advanced resuscitation measures such as ambu bag, chest compression, drugs like adrenaline and endotracheal intubation, these measure point toward high probability HIE [odd ratio and CI= 3 (1.28-7)]. This finding goes with (had found that gestational age more than 40 weeks was associated with higher risk of HIE. This is not the case in our study, we have found that gestational age more than 40 weeks is not a risk factor [odd ratio and CI=0.34 (0.6-1.97)]. This differences may be attributed to low threshold for caesarian section to pregnant women with gestational age more than 40 weeks in our center so they will not exposed to vaginal delivery which we proposed it as a risk factor for HIE.

They had studied infertility treatment as a risk factor for HIE and he report it as significant predictor. We also have been studied that factor because we have fertility center in our city and a proportion of our study population get conception by fertility treatment. However; we found it carry no more risk for getting HIE. This may be explained by good antenatal care and obstetric management to these precious pregnancies [5].

Conclusion

We conclude that neonate of pregnant women whose have rural residency and had been subjected to complications during her pregnancy have a higher probability to have HIE. Also a pregnant women who have vaginal delivery and subjected to complication during labor are more prone to get HIE in her baby.

Neonates who were delivered in a gestational age less than 37 weeks and required advanced resuscitation measures have a higher probability to get HIE. We recommend that:

Improve the obstetric care in rural area to decrease neonatal complications.

Good obstetric management of pregnancy complication such as gestational hypertension, gestational diabetes, respiratory or urinary tract infection and antepartum bleeding.

Uses of assisted labor technique as forceps and vacuum to manage difficult labor.

Uses of cardiotocogram and fetal scalp gas analysis in addition to other measures to decrease the neonatal complications.

HIE is one of preventable causes of children handicap so we should try our best effort to decrease its incidence.

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