Prevalence of Hypoxic Ischemic Encephalopathy among Neonates in a Tertiary Care Hospital Karachi

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ABSTRACT

Birth asphyxia affects 3–5 infants per 1000 live births, with 0.5–1 infants per 1000 live births developing brain damage in the form of hypoxic ischemic encephalopathy (HIE). HIE prevalence data for developing countries are not available. So aim of the current study was to find out the prevalence of Hypoxic Ischemic Encephalopathy Among Neonates in a tertiary care Hospital Karachi**.**A descriptive cross-sectional study was conducted at Paediatrics Ward Unit-II of Civil Hospital, Karachi The inclusion crieteria of the study was the age of patient's mother between 18-40 years, history of fetal distress and APGAR score 0-3 for longer than 5 minutes Sarnat criteria was used to diagnose HIE at the time of admission. Data was collected on self-designed proforma consisting of demographic variables including maternal age, gestational age, parity and APGAR score. Data was entered and analyzed in Statistical Package for Social Science (SPSS) version 20. The mean ± SD age of mother of neonates enrolled in this study was 27.41 ± 5.44 years.Almost two thirds of all mothers, were of age group 21-30 years. It is worth

noting that 37.2% cases presented at gestational age of 33-36 weeks. More cases of HIE were of female gender. About 46.2% had presented with serum pH of 6.01 to 6.99. Simultaneously; it was also found that children having 5 minutes APGAR score of 1-2 were 715% while neonates weighing between 2001 and 3000 grams were 84.1. The frequency of hypoxic ischemic encephalopathy was 44.8%.It can be concluded that the prevalence of hypoxic ischemic encephalopathy is 44.8% in the current setting. Female gender, elder age mothers, post-mature babies, very low or very high birth weight and low APGAR score are more associated factor with higher frequency of HIE.

Keywords:-Hypoxic ischemic encephalopathy, Birth asphyxia, Cerebral palsy

Introduction

Hypoxic Ischemic Encephalopathy, also termed as birth asphyxia, is a neurological disorder among neonates as a result of hypoxia soon after birth. HIE is a disorder in which clinical manifestations indicate brain dysfunction (Delivoria-Papadopoulos & Marro, 2010; Shankaran, 2010). The majority of the underlying pathologic events of HIE are a result of impaired cerebral blood flow (Shalak & Perlman, 2004) and oxygen delivery to the brain (Cotten & Shankaran, 2010). However, the pathophysiologic effects of the hypoxic-ischemic insult are complex and evolve over time (Obstetricians, Encephalopathy, Palsy, & Pediatrics, 2003). It is clinically defined as syndrome of disturbed neurological function in the earliest days of life in the term infant, manifested by difficulty with initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness, and often seizures (Alvarez-Diaz, Hilario, De Cerio, Valls-i-Soler, & Alvarez-Diaz, 2007).

Estimates of the incidence of perinatal asphyxia are quite variable from one study to another. In developed countries, perinatal asphyxia (lack of oxygen in the brain around the time of birth) affects 3–5 infants per 1000 live births, with 0.5–1 infants per 1000 live births developing brain damage in the form of hypoxic ischemic encephalopathy (HIE). Up to 60% of infants with HIE die and 25% of survivors are left with a significant handicap (Kurinczuk, White-Koning, & Badawi, 2010).

Despite improvements in perinatal care in the developed world, HIE remains a major cause of

mortality, resulting in up to 25% of perinatal mortality and morbidity and giving rise to between 8 and 15% of all cases of cerebral palsy. Once an infant developed birth asphyxia, there is no way to stop brain damage or death from occurring (Horn et al., 2009). Literature review has reported the rate of individual long-term neurodevelopmental outcomes after HIE: 45% of sequelae were represented by cognition and developmental delay or learning difficulties, 29% by cerebral palsy, 26% by blindness or vision defects, 17% by gross motor and coordination problems, 12% by epilepsy, 9% by hearing loss or deafness, and 1% by behavioral problems (Mwaniki, Atieno, Lawn, & Newton, 2012). HIE prevalence data for developing countries are not available. So aim of the current study was to find out the prevalence of Hypoxic Ischemic Encephalopathy Among Neonates in a tertiary care Hospital Karachi.

Methodology

A descriptive cross-sectional study was conducted at Paediatrics Ward Unit-II of Civil Hospital, Karachi from 07 March 2020 to 06 September 2020. Sample size calculated was 145. The non-probability sampling technique was used. The inclusion crieteria of the study was the age of patient's mother between 18-40 years, history of fetal distress and APGAR score 0-3 for longer than 5 minutes while those neonates were excluded who has major systemic malformations. Study got approval from Research Evaluation Unit of CPSP, Karachi and the ethical review committee of Civil Hospital. Laboratory tests was carried out in the central laboratory of the civil hospital. Sarnat criteria was used to diagnose HIE at the time of admission. Data was collected on self-designed proforma consisting of demographic variables including maternal age, gestational age, parity and APGAR score.

Data was entered and analyzed in Statistical Package for Social Science (SPSS) version 20. The numerical variables including age of mother, neonatal weight, gestational age and parity were expressed in mean with standard deviation (Mean ± SD) while categorical variables were expressed in frequencies and percentages.

Results

The mean ± SD age of mother of neonates enrolled in this study was 27.41 ± 5.44 years which ranged from 18-40 years. Mean ± SD gestational age was 34.63 ± 3.87 weeks which ranged from 28 to 42 weeks. (Table: 1). The mean ± SD number of children was 1.28 ± 0.63 children with

minimum and maximum numbers of children (Range: 0-2 children). The mean ± SD serum pH was 5.87 ± 0.82 with a range of 4.27 to 6.93. (Table: 1). The mean ± SD Apgar score at 5 minutes was 1.43 ± 0.91 with a range of 0 to 3 while the mean ± SD neonatal weight was 2425.521 ± 427.31 grams which ranged from minimum 1060.4 grams to maximum 4024.4 grams as mentioned in Table 1.

Table 1 Demographic characteristics of study participants		
n = 145	Mean	Standard Deviation
Age of the mother	27.41	5.44
Gestational age (in weeks)	34.63	3.87
Number of Children	1.28	0.63
Serum pH	5.87	0.62
Apgar score at 5 minutes	1.43	0.91
Neonatal weight	2425.521	427.31

Almost two thirds of all mothers, i-e; 60.7% (n = 88) were of age group 21-30 years. Other 28.3% (n = 41) were of age group 31-40 years while those is age group 18-20 years were 11% (n = 16). (Figure: 1). It is worth noting that 31% (n = 45) cases presented at gestational age of 28-32 weeks, 37.2% (n = 54) at gestational age of 33-36 weeks, 22.8% (n = 33) at gestational age of 37-40 weeks while only 9 % (n = 13) presented at gestational age of >41 weeks. A vast majority 90.3% (n = 131) had 1-2 children while only 9.7% (n = 14) were nulliparous. It was strikingly important to note that more cases of HIE were of female gender as found in this study that 62.1% (n = 90) were females while remaining 37.9% (n = 55) were males. It was noted that 10.3% (n = 15) has serum pH up to 5.00, other 43.4% (n = 63) had serum pH between 5.01 & 6.00 while about 46.2% (n = 67) had presented with serum pH of 6.01 to 6.99. Simultaneously; it was also

found that children having 5 minutes APGAR score of 3 were 14.5% (n = 21), other having 5 minutes APGAR score of 1-2 were 715% (n = 103) while those having APGAR score of 00 were 14.5% (n = 21).. Neonatal weight categories reveal that 5.5% (n = 8) weighed less 2000 grams, those weighing between 2001 and 3000 grams were 84.1% (n = 122), those weighing between 3001 and 4000 grams were 9.7% (n = 14) while only one neonate i-e; 0.7% was born with weight of >4001 grams. All the variables of study participants have been reported in Table 2. The frequency of hypoxic ischemic encephalopathy was 44.8% as shown in Figure 1.

Table 2 Group stratification of variables among study participants		
Variables	Frequency	Percent
Maternal age		
18-20 years	16	11.03
21-30 years	88	60.68
31-40 years	41	28.75
Gestational age		
28-32 Weeks	45	31
33-36 Weeks	54	37.2
37-40 Weeks	33	22.8
> 41 Weeks	13	9
Parity		
Nulliparity	14	9.7
1-2 Children	131	90.3
Gender of Neonate		

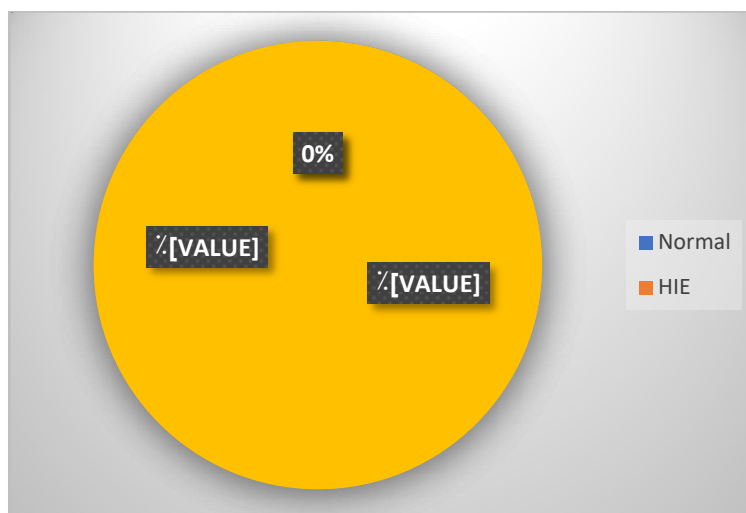| Male	55	37.93
Female	90	62.06
Serum pH		
Upto 5.00	15	10.3
5.01 to 6.00	63	43.4
6.01 to 6.99	67	46.2
APGAR score at 5 minutes		
Zero	21	14.5
1-2	103	71.0
3	21	14.5

Figure 1 Frequency of hypoxic ischemic encephalopathy among neonates

Discussions

Despite the important advances in perinatal care in the past decades, hypoxic ischemic encephalopathy (HIE) remains a severe condition leading to significant mortality and morbidity.

HIE is a worldwide problem and its contribution to cerebral palsy and mental retardation constitutes a significantly high mortality rate (Bax, Flodmark, & Tydeman, 2007). It has been estimated that 30% of cases of HIE is in developed countries while majority (60%) of cases reported is in developing countries (Fatemi, Wilson, & Johnston, 2009).

In developed countries, perinatal asphyxia (lack of oxygen in the brain around the time of birth) affects 3–5 infants per 1000 live births, with 0.5–1 infants per 1000 live births developing brain damage in the form of hypoxic ischemic encephalopathy (HIE) (Kurinczuk et al., 2010). Roughly 10-60% of affected infants die in the newborn period and at least 25% of those that survive have significant brain damage and long-term neurodevelopmental impairments in developing countries (Graham, Ruis, Hartman, Northington, & Fox, 2008; Martin, Fanaroff, & Walsh, 2011). In Pakistan; perinatal events observed in a community based study in Lahore, showed that affected cases were 2.16% with case mortality of 65% 8. Current study found a high prevalence of HIE i.e. was 44.8%.

A prolonged depression of the Apgar score in HIE cases has been shown to be related with death or severe neuro developmental outcome(Muraskas & Morrison, 2010). The current study favored this finding by reporting a very low APGAR score (1-2) in majority of cases of HIE (71%).The pH and base deficit in arterial blood gas is useful for determining which newborns have asphyxia requiring further evaluation for the development of HIE. The best indicator for asphyxia is severe metabolic acidosis (pH < 7.0 and base defcit $\geq$ 12 mmol/L) in umbilical cord arterial blood at the time of delivery (Martinez-Biarge et al., 2011). Current study found pH of < 7.0 among all cases of HIE. Study by Futrakul S, et al., found male gender, post-term neonates, low birth weight, very high birth weight (macrosomia) and APGAR < 3 at 5 minutes were significantly hit by HIE (Sitthivuddhi Futrakul, Praisuwanna, & Thaitumyanon, 2006). The current study found similar results except the difference of gender. In current study it was found that female gender was more affected with HIE compared to males.

For effective prevention of HIE, proper training of the medics and paramedics especially working in peripheries is required for early identification of birth asphyxia and appropriate intervention should be carried under mother and child health programs. Besides that, public health awareness needs to be improved.

Conclusion

It can be concluded that the prevalence of hypoxic ischemic encephalopathy is 44.8% in the current setting. Female gender, elder age mothers, post-mature babies, very low or very high birth weight and low APGAR score are more associated factor with higher frequency of HIE

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