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Original Research Article

Risk Factors Assessment for Moderate to Severe HIE

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Abstract

Introduction: The following are risk factors for intrapartum haemorrhage: breech presentation, protracted labour, stationary labour, prolonged rupture of the membrane during term, caesarean section, home birth, and maternal fever. Preterm births, low birth weight, foetal distress, and child resuscitation are foetal risk factors.6.7 However, perinatal variables related to labour and delivery appear to have minimal effect on the prevalence of mental retardation and seizures, according to the British National Child Development Study (BNCDS). The prevalence of true intrapartum asphyxia in babies with CP was about 3–13% 8. "Successful neonatal resuscitation requires adequate preparation, accurate evaluation, and prompt initiation of support," according to the American Academy of Paediatrics. "An appropriate preparation of an anticipated high risk delivery requires communication between the persons caring for the mother and those responsible for resuscitation of the newly born child."

Material and Method: In instances, a thorough history of the current disease is obtained, a thorough general examination, a thorough systemic examination, and staging is carried out using Levene44 staging for preterm newborns and Sarnat and Sarnat 31 staging for term babies. Complications and results have been examined in light of this information and with the aid of studies.

A pre-made case report format (CRF) is used to gather information on the mother and child. Data gathered from case reports was entered into a master chart. Variables within the master chart were then analysed using SPSS software and all calculations were made in accordance with chi-square, anova, and p-value analyses.

Result: The incidence of HIE Newborn is more in 18-23 yrs age group i.e. 51.5%. Primigravida has significant association with HIE Newborn constitutes 69.2%. Maternal Anemia has a significant association with HIE Newborn constitutes 56.5%. Prolonged labor and obstructed labor has significant association with HIE Newborn accounts 46.2%. There are more number of HIE Newborn cases in low socioeconomic status (65.8%) Male babies are more prone for HIE Newborns accounts 63.5%.Meconium stained liquor accounts 26.9% with HIE Newborns. Oligohydraminos accounts 19.6% for HIE Newborns.

Conclusion: It appears that even with breakthroughs in foetal medicine and technology, birth asphyxia is linked to a considerable risk of morbidity and death in high-early infants. After ten years, there was no change in its mortality, morbidity, and risk factors. Research reveals that the development of HIE was mostly associated with maternal anaemia as a risk factor. Significantly higher severe grades of HIE were linked to prolonged and obstructed labour. Low socioeconomic level and severe HIE newborns are highly related. Primagravidae have a higher frequency of HIE. Most frequently, there are complications including shock and sepsis. A five-minute APGAR score of less than seven indicates a significant incidence of birth asphyxia.

Keywords: HIE, Anemia, Apgar score, Sex.

Introduction

The prevalence of HIE ranges from 0.1% to 0.5% of total live births and contributes to 23% of the neonatal deaths worldwide [1]. The reported incidence of perinatal asphyxia in India varies from

2 to 16.2% in community-based studies, with the reported case fatality rates ranging from 38.5 to 74% [2]. Presently as per SRS 2020 data, 26 neonates are dying every year out of 1000 live births in Odisha, most common cause being birth asphyxia. Out of the estimated 2- 2.5 million annual neonatal deaths in the country, between 3000-35000 may be due to perinatal asphyxia [3]. The early neonatal deaths (within first 7 days) contribute to 50 to 60% of infant mortality rate (IMR). Odisha, Madhya Pradesh, and Uttar Pradesh rank high in the early neonatal deaths in India. At the same time Odisha ranks highest in perinatal mortality and still birth rate [4,5]. We know under 5 mortality denotes the economic status and health facility of the country. Neonatal death is major subset of less than 5 mortality as rate comprising about 41%. Among the etiology of neonatal death, birth asphyxia is 2nd most common cause comprising of 20%. [4]

Hypoxic Ischemic Encephalopathy is a pathophysiological condition occurs due to lack of oxygen (hypoxia) and lack of perfusion (ischemia). In children with asphyxia, there is a widespread damage to brain (28%), kidney (50%), lungs (25%), and cardiac (25%) cases. This results in encephalopathy, irreversible renal cortical necrosis, persistent pulmonary hypertension (PPHN), Necrotizing enterocolitis (NEC), impaired thermoregulation, lactic acidosis, bleeding, hypoglycemia, and hypocalcemia [5].

The exact etiology of which is multifactorial including antenatal, intra natal and postnatal factors. Many of the above factors are preventable and have potential for reducing the incidence of mortality and morbidity due to asphyxia. Several studies in general populations have identified risk factors for HIE. Some antepartum risk factors are increasing or decreasing maternal age, place of delivery, antenatal visit, booking status, pre-eclampsia, malaria during pregnancy and primigravida [6,7].

Intrapartum risk factors are breech presentation, prolonged labour, stationary labour, term prolonged rupture of membrane, caesarean section, home delivery and maternal fever. Fetal risk factors are resuscitation of child, preterm babies, fetal distress and low birth weight. [6,7]

On the other hand the British national child development study (BNCDS) suggests that perinatal factors of labour and delivery contribute little to the incidence of mental retardation and seizures. Only 3-13% of infants with CP had evidence of actual intrapartum Asphyxia [8]. Adequate preparation, accurate evaluation and prompt initiation of support are the critical steps to successful neonatal resuscitation" (American Academy of Pediatrics) and "appropriate preparation of an anticipated high risk delivery requires communication between the persons caring for the mother and those responsible for resuscitation of the newly born. [8] As per Sarnat HB & Sarnat MS, HIE has been classified as stage-1 (mild), stage-2 (moderate), and stage-3 (severe). The mortality of stage-1, 2, and 3 are 0%, 20%, and 50% respectively. The majorities of survivors with HIE 3 and HIE 2 have significant neurological damage and develop cerebral palsy and intractable seizures [9]. In spite of success with various models and laboratory trials in animals, the outcome with best of possible treatment has poor outcome with severe forms of HIE.

Material & Method

Study Designs: Prospective observational study **.**

Study Periods: 2 YRS (NOV 2020 TO OCT 2022)

Study Site: Special Newborn Care Unit (SNCU) , Department of Pediatrics, M.K.C.G Medical College & Hospital, Berhampur.

Sample Size: 260 NEWBORN CASES

Inclusion Criteria: All babies getting admitted to SNCU MKCG with moderate to severe HIE-2/ HIE-3 as per Sarnat & Sarnat classification.

Exclusion Criteria:

- Babies having gross congenital malformation.
- Babies who have HIE-1

Sample Size:

The sample size is calculated based on the prevalence of birth asphyxia using the formula

$$N = \frac{4PQ}{d^2}$$

P= prevalence from studies=16

Q= 100-P=100-16=84

D=allowable error (5%)

Sample size [n] =215

Taking 20% attrition, sample size came to be 215+45=260.

Therefore sample size for my study is 260.

Following information was collected for mothers of all cases. Name, Age, Reg. No., Address, Socioeconomic status, order of birth, details of ANC, details of previous illnesses, anemia, APH, h/o maternal diseases like preeclampsia, eclampsia, h/o PROM, prolonged labour, place of delivery and mode of delivery. For each baby in the study and control following details collected. Sex, birth weight, maturity, Apgar score at 1 min and 5 min, h/o cord around neck, MAS .For cases, history of present illness taken in detail, general examination and systemic examinations done in detail and

staging -done with Sarnat and Sarnat staging for term babies and Levene staging for preterm babies. With this knowledge and with the help of investigations complications and outcome have been studied. Information about mother and baby are collected by a predesigned case report format [CRF]. Collected data from case report format was recorded in master chart and variables of data from master chart was subjected for analysis in SPSS software and all data were calculated in chi-square , anova & p-value analysis done accordingly.

Result

Table 1: Distribution Of Hie According To Distance Travelled For Delivery

		Number[n=260]	Percentage%
Distance	<5km	15	5.8
	6-20kmkm	39	15.0
	21-50km	99	38.1
	>50km	107	41.2
	Total	260	100.0

The above table shows association of HIE is more in patient travelled >50km [41.2%], 20-50km [38.1%],6-20km[15%], <5km[15%] for delivery.

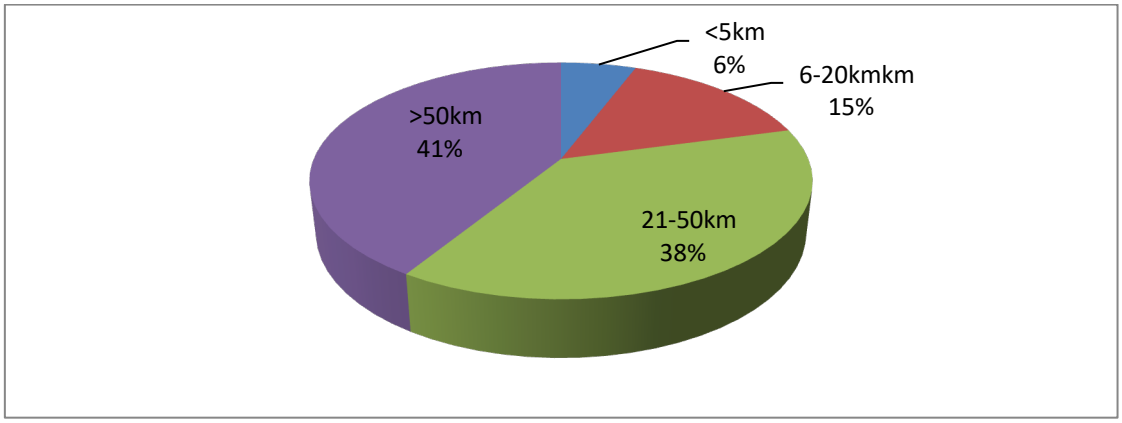

Figure 1: Distribution Of Hie According To Distance Travelled For Delivery

Table 2: Showing distribution of HIE according to belonging of patient

	Number[n=260]	Percentage %
Rural	221	85
Urban	39	15

The above table shows that rural patient is more affected i.e 85% than urban [15%].

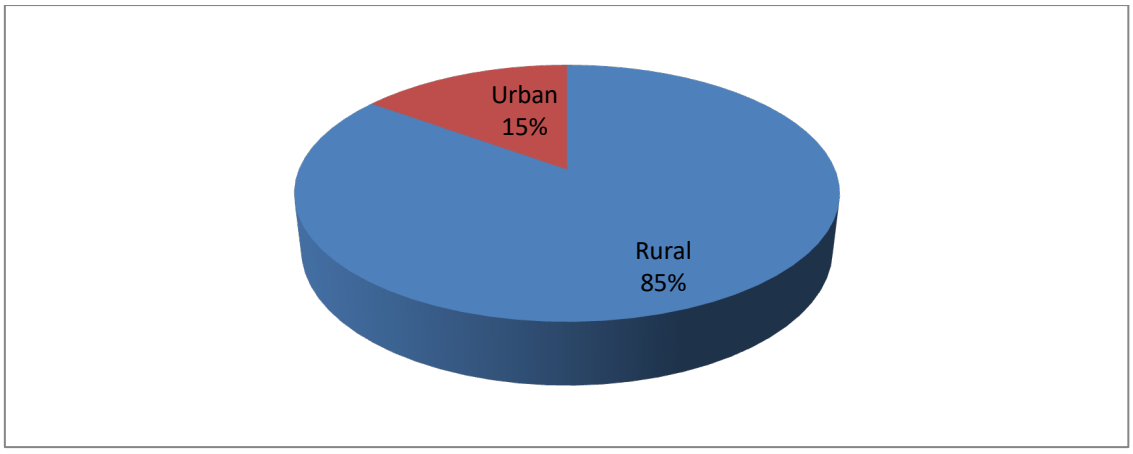

Figure 2: Showing Distribution Of Hie According to Belonging of Patient

Table 3: Distribution of HIE According to Inborn/Outborn.

	Number Of Cases	Percentage%
Inborn	114	43.8
Outborn	146	56.2

The above table shows that more number of HIE cases belongs to outborn [56.2%] followed by inborn[43.8%].

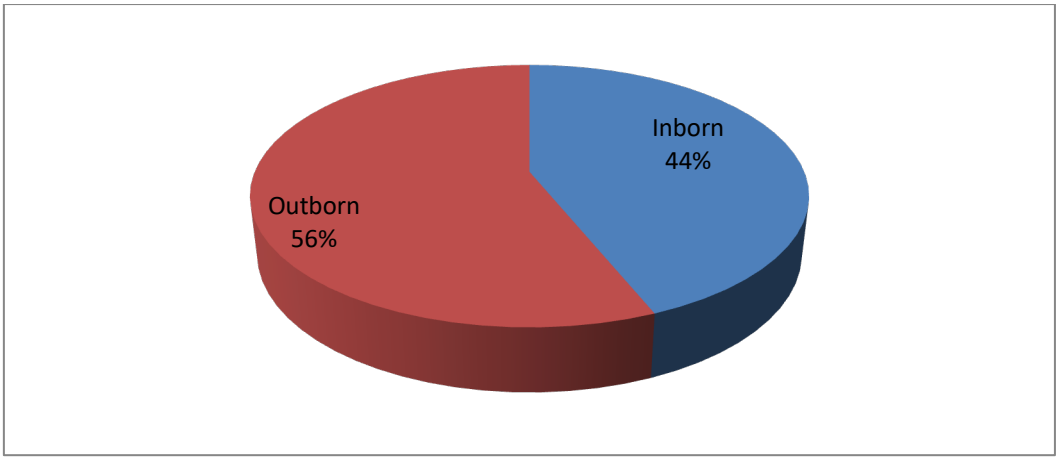

Figure 3: Distribution of HIE According to Inborn/Outborn

Table 4: Distribution of HIE according to Gender

	Number [N=260]	**Percentage %**
Female	95	36.5
Male	165	63.5

The above table shows male sex is more affected i.e 63.5% followed by female 36.5%.

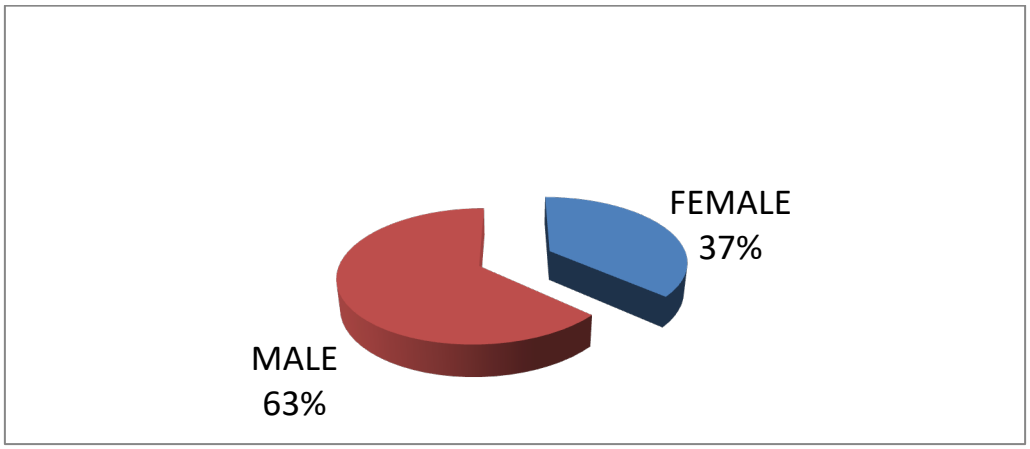

Figure 4: Distribution of HIE according to Gender

Table 5: Distribution Of HIE According To Mothers Education

	Number [N=260]	**Percentage%**
5th Class	76	29.2
10th Class	112	43.1
12th Class	53	20.4
PG	19	7.3

The above table shows distribution of HIE cases according to mothers education in which upto 10^{th} class contributes 43.1%, 5^{th} class [29.2%], 12^{th} class[20.4%], pg [7.3%]

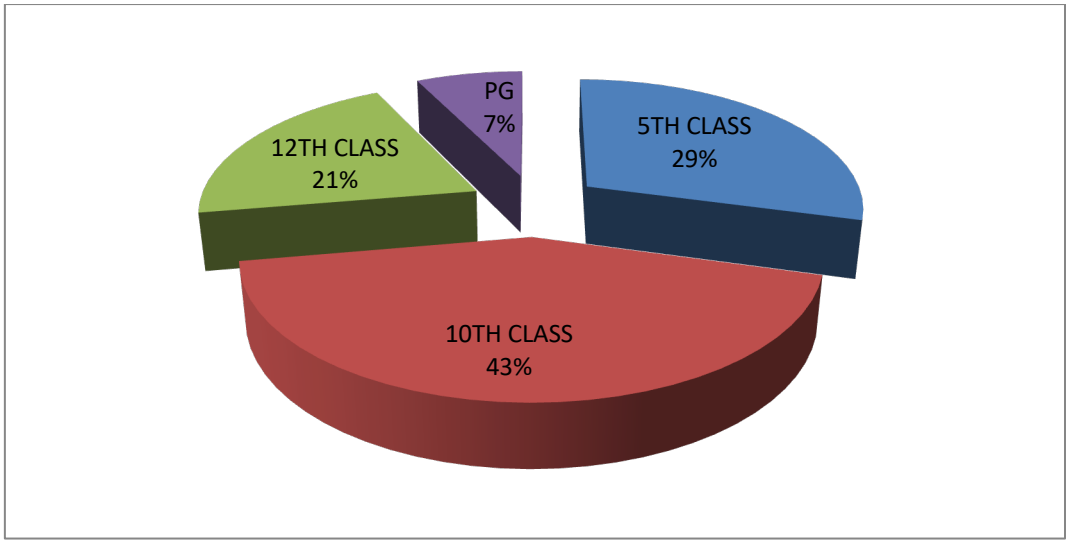

Figure 5: Distribution Of Hie According To Mothers Education

Table 6: Distribution Of Hie According To Socioeconomics Status

	Number [N=260]	Percentage%
Lower	81	31.2
Lower middle	68	26.2
Upper class	8	3.1
Upper lower	90	34.6
Upper middle	13	5.0

The above table shows that HIE are more in upper lower[34.6%] followed by lower[31.2%],lower middle[26.2%],upper middle [5%],upper class[3.1%] according to socioeconomic status.

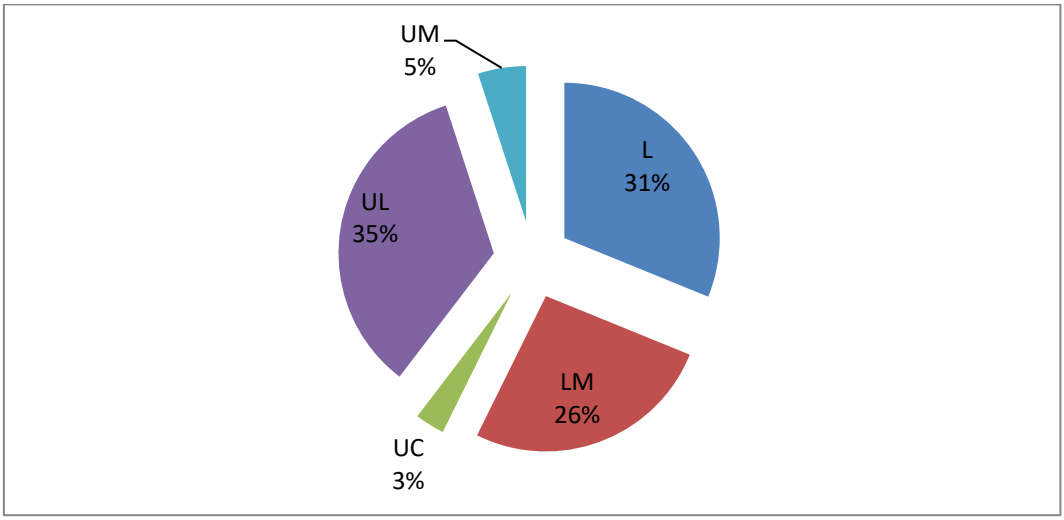

Figure 6: Distribution of Hie According to Socioeconomics Status

Table 7: Distribution of Hie According to Number of ANC Visit

	Number[n=260]	Percentage%
1	6	2.3
2	43	16.5
3	41	15.8
4	170	65.4

The above table shows that distribution of HIE according to ANC Visit are 4th visit [65.4%],3rd visit[15.8%],2nd visit[16.5%],1st visit[2.3%].

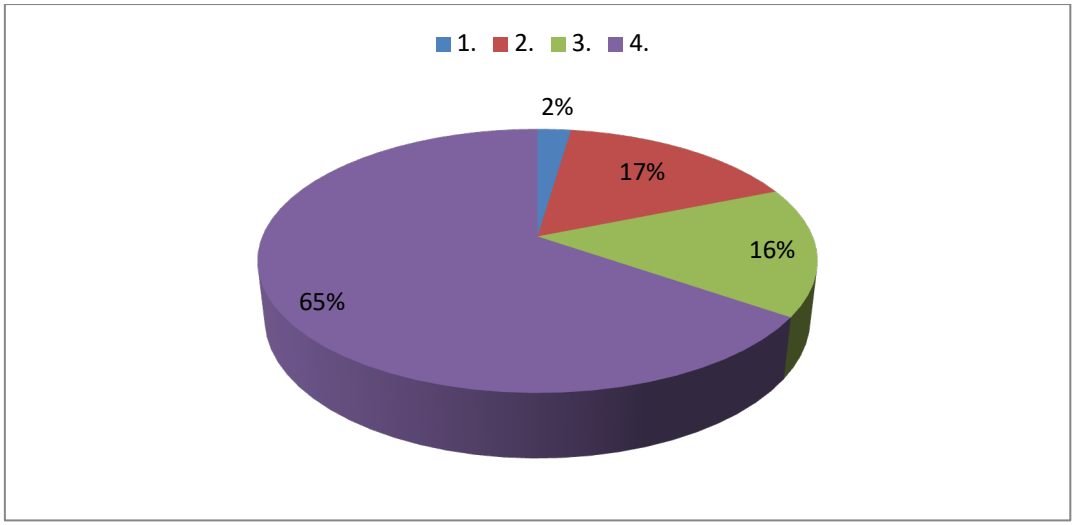

Figure 7: Distribution of HIE According To Number of ANC Visit

Discussion

A total of 260 cases of moderate and severe Hypoxic Ischemic Encephalopathy admitted to SNCU, Dept. of Pediatrics, M.K.C.G, during the period November 2020 to October 2022.

Our study shows that, 146 [56.2%] HIE babies delivered outside and 114[43.8%] delivered in inside. Study by Sulayman M et al. Shows that out of 120 asphyxiated babies 80 (67%) babies were born outside and 40(33%) cases were born inside at hospital. Another study by Masahiro Hyakawa et.al showed 75.5% HIE babies were outborn and 24.5% inborn. As our hospital is a tertiary referral centre for south Odisha, more number of delivery occurs which explains the difference in statistics in our study and there.

Our study depicts that 165[63.5%] are male babies and 95[36.5%] female in our study with M:F ratio 1.73:1.In our study gender has strong association with HIE with a p-value [0.01] which is significant. In an Indian study by Raj Prakash et al. among 120 babies male to female ratio was 1.8:1 which is close to my study showing male preponderance and p-value[<0.05].Study by Solayman M et al. among the neonates 61.6% (130) were male and 38.4% (81) were female. The male to female ratio was 1.6:1. Another study by Lena et.al showed that 249[53%] moderate to severe HIE babies were male and 47% female which is similar to my study. Similar study by Andreas et.al shows that 42[58.3%] male and 30[41.7%] female.

Our study shows that Mother studied upto 10^{th} class 112 [43.1%] followed by upto 5^{th} class 76[29.2%], upto 12^{th} 53[20.4%], upto PG 19[7.3%] having HIE in new born which explains low education status of women in rural and developing areas.. In a Bengal study by Soalyman M et al.49 (41%) cases mother were having no education, 39 (32.5%) cases mothers had studied upto primary, 24(20%) cases mothers had education upto SSC, 8 (6.7%) cases mothers studied above SSC. A study by Andreas Chiabi et al. found that Mothers level of education primary constitutes 13.9%, secondary 62.5% and university 23.6% contributing for HIE newborns. Patient referred from peripheral districts having less percentage of literacy which shows the difference with other study.

We found in our study that HIE in new born are more in lower 90[34.6%] followed by upper lower 81[31.2%], lower middle 68[26.2%],upper middle 13 [5%],upper class 8[3.1%] according to socioeconomic status depicts the low socioeconomic state of rural areas. In other study conducted by Solayman M et al. low class having 82 (68.3%) cases, middle class belongs to 34 (28.3%) cases, upper class having 4(3.3%) cases which is very similar to our study. Mother belonging to lower socioeconomic status 55% and middle class 45% having HIE babies in study done by B. Babu et. al [2014]. Another study done by Igboanugo s et al. shows upper lower 46%, lower53%, lower middle 29%. Survey in different parts of India indicates that about 50-60 percentage of women belonging to low socioeconomic status. Low socioeconomic status may increase asphyxia risk by influencing maternal nutritional status, care seeking and access to health care services during the antenatal and intrapartum periods. Most patient referred to our centre belongs to low socioeconomic status which shows the difference with other study.

In our study period we found out that 211[81.2%] mothers received optimal i.e.3 or more ANC and 49[18.8%] received non-optimal .A study by Geeta Moolchandani et al. shows that 33.8% mother received inadequate and 66.2% adequate ANC causing HIE. A similar study by B Babu et al. shows that mother received regular ANC constitutes 28.1% and irregular ANC

71.9%.Another study by Gumus et al shows 56% received optimal and 44% non- optimal ANC. Damodar et al. reported moderate to severe HIE: lack of ANC, inadequate ANC[OR-1.8]. As UNICEF, NRHM focussing on hospital delivery and increasing antenatal care registration, so more number of mothers got optimal ANC in our study that shows the difference statistics comparison to other study.

In our study we found that HIE cases are more in rural area 221[85%] where as in urban area 39 [15%]. Our hospital being tertiary care hospital for various neighbouring rural and hilly districts hence the number of cases from rural areas is more. Study conducted by Solayman M et al. 115 (96%) cases were from rural areas, 5 (4%) cases were from urban areas. A similar study Nadia, jennifar et al found that 70% mother belonging to rural area and 30% urban area.

Conclusion:

Evidently, birth asphyxia is associated with significant morbidity and mortality in HIE Newborns despite of advances in technology and knowledge in fetal medicine. Its mortality and morbidity and associated risk factors were not changed much over decade. Study shows maternal anemia was a predominant risk factor for development of HIE. Prolong and Obstructed labor was significantly associated with severe grades of HIE. Severe HIE babies are closely associated with low socio-economics status. HIE prevalence more in primigravida. Complications like sepsis and shock are most commonly associated. APGAR score <7 at 5min shows high prevalence of birth asphyxia. Primary health care, awareness programmes & health policy in peripheral areas, referral system etc should be strengthened with proper training for health care personnel especially in neonatal resuscitation. Timely intervention, supportive care, close monitoring and prevention of complications are the main elements of managing HIE related mortality and morbidity.

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