

Frequency of Intraventricular Haemorrhage in Preterm Neonates

JUNAID RASHID, M SHAHID, SUMAIR ANWAR, DURE SHARAF, M TARIQ BHATTI

ABSTRACT

Background: Intraventricular hemorrhage is one of the most common problems of premature Infants. Its causes severe neurological morbidity and mortality.

Objective: To determine the frequency of IVH in clinically suspected premature neonates in pediatric unit Jinnah hospital Lahore.

Study Design: Hospital based cross sectional study.

Setting: Pediatric department, Jinnah Hospital Lahore.

Duration of Study: 17th March 2007 to 17th March 2008.

Sample Size: 100 preterm neonates were included in study.

Methods: 100 cases with prematurity were included. History was recorded with special emphasis on events of pregnancy, delivery and presence or absence of known risk factors. The neonate was examined clinically and cranial ultrasound was done on 1st day of life. Findings were noted on a pre-designed Performa.

Results: Out of total 15% patients developed IVH. The gestational age of babies was followed, which showed that 63% presented were from 30 to 35 completed weeks of gestation. 62% were male and 38% were females. Most of the neonates were very low birth weight 41%. 37% were low birth weight, 13% were extremely low birth weight and 09% were incredibly low birth weight. 11% preterm neonates developed IVH during the first 24 hours of life. Out of the total who developed IVH, 09% developed grade I, 03% developed grade II, 01% grade III, and 02% developed grade IV.

Conclusion: IVH is the major problem of preterm infants and cranial ultrasonography can accurately predict the presence of IVH IVH is inversely related to birth weight of neonate.

Key words: Intraventricular Hemorrhage, Premature, Low Birth Weight

INTRODUCTION

Intraventricular hemorrhage (IVH) is the commonest type of intracranial hemorrhage in premature infants that occurs in periventricular subependymal germinal matrix¹. Early complications of prematurity include birth asphyxia, respiratory distress syndrome (RDS), intra-ventricular hemorrhage (IVH), patent ductus arteriosus (PDA), infections, Apnea of prematurity, metabolic complications like hypoglycemia, hypocalcemia and necrotizing enterocolitis. Intra-ventricular hemorrhage often progresses in severity and causes severe neurological morbidity and mortality. Severity of IVH is related to higher risk of developmental handicap². 80-90% of cases occur between birth and 3rd day of life. Frequency of silent hemorrhages is as high as 68% in very low birth weight infants. Likelihood of clinical signs and symptoms increases with the severity of hemorrhage³.

IVH is caused by the presence of highly vascularised subependymal germinal matrix, towards which a major portion of blood supply of immature cerebrum is directed. Germinal matrix is the neural

vascular tissue that is normally involutes by birth⁴. Cerebral palsy, mental retardation and seizures are neurological disorders observed after IVH⁵.

Infants with IVH present with findings related to anemia or hemorrhagic shock or in severe cases, sudden and significant deterioration associated with metabolic acidosis, glucose instability, respiratory acidosis, apnea, pallor, signs of respiratory distress, hypotonia, altered mental status, fullness of the fontanelles, seizures, shock and death.

IVH is diagnosed on the basis of history, clinical manifestation and cranial ultrasonography. Sonography is the diagnostic tool of choice for screening, examination and follow up of individuals with IVH⁶. The improved accuracy of diagnosis of intraventricular hemorrhage using ultrasound allows a potentially more reliable reassessment of clinical associations and sequel of this condition. Other imaging modalities that can be used to diagnose intraventricular hemorrhage are CT scan & MRI, but these are impractical for the routine clinical use as these are relatively expensive⁷. CT exposes the neonates to ionizing radiation. CT& MRI also require the mobility of infant from nursery.

Cranial ultrasonography can be accurately and safely used to predict the presence of IVH in

Department of Paediatrics, Allama Iqbal Medical College/Jinnah Hospital, Lahore
Correspondence to Dr. Junaid Rashid, Assistant Professor Email: doc_junaid@hotmail.com>

premature infants, who are so vulnerable that other imaging modalities can't be routinely used. Cranial ultrasound is shown to be a sensitive, convenient and safe method for detecting intraventricular hemorrhage in premature neonates. The ultrasonic appearance of intraventricular hemorrhage is categorized according to position and extent⁸. The Volpe grading system constitutes a simple method for sonographic grading.

GRADE I Subependymal hemorrhage with no IVH
 GRADE II IVH occupying 10 to 50% of ventricular area on parasagittal view
 GRADE III IVH occupying more than 50% of ventricular area.
 GRADE IV Severe IVH with periventricular echodensity.

Many studies have been conducted internationally regarding occurrence of IVH in neonates with prematurity and their immediate outcomes but insufficient data is available in local studies. It is required on national and international levels to assess the frequency of IVH in preterm neonates, so that an effective strategy can be designed to monitor IVH in preterms and find out way to minimize its occurrence.

MATERIAL AND METHODS

Hospital based cross sectional study was carried out in Neonatal Unit of Jinnah hospital Lahore from 17th March 2007 to 17th March 2008. The objective of the study was to describe the frequency of intraventricular hemorrhage in preterm babies in neonatal unit (NNU), Jinnah hospital, Lahore (JHL). 100 cases (preterm neonates getting admitted in NNU presenting within first 24 hours of their life were included in the study through non-probability sampling. Babies who were born before 37 completed weeks of gestation from the first day of last menstrual period were defined *Preterm*, babies from birth to 28th day of life were defined *Neonate and Interventricular Hemorrhage* was labeled with an evidence of bleed within the ventricles on cranial ultrasonography. However neonates with congenital defects like meningomyelocele and congenital heart disease were excluded.

All preterm babies admitted in the NNU fulfilling the inclusion and exclusion criteria were assessed for intraventricular hemorrhage (after getting informed consent from parents and ensuring confidentiality) on the basis of history from parents, clinical examination and course of illness in first seven days of life. On admission weight and head circumference were noted and followed on daily basis. Vital signs were monitored. Base line investigations in the form of complete blood picture including hemoglobin, total leukocyte count (TLC), differential leukocyte count

(DLC), platelet count and ESR, CRP, blood sugar random (BSR) and blood culture were sent for all babies. Intraventricular hemorrhage was suspected in babies with lethargy, apnea, pallor or cyanosis, failure to suck well, shrill cry, decreased muscle tone or paralysis, metabolic acidosis, shock and tense/bulging fontanel. All such babies had cranial ultrasonography and CT scan of brain to look for intraventricular hemorrhage. All neonates were managed according to the routine criteria of NNU and investigations were repeated whenever required. All investigations were sent to pathology lab of Jinnah Hospital Lahore except blood cultures, which were sent to Microbiology Section of Pathology Department, Allama Iqbal Medical College Lahore. Cranial ultrasonography and CT scan were performed at radiology department of Jinnah hospital Lahore.

Data analysis procedure: Collected data on performa was entered, described and analyzed statistically in SPSS 11. The variables of interest included gestational age, sex, weight, mode of delivery (normal vaginal, assisted with forceps or vacuum, elective C- section and emergency C-section), signs and symptoms (Lethargy, Poor suck, Pallor, Cyanosis, Apnea, high pitch/ shrill cry, Decreased muscle tone, Paralysis and tense/bulging fontanel), age of presentation of IVH, grading of IVH (grade I to IV), imaging technique used for confirmation of IVH (cranial USG alone, CT brain alone or cranial USG and CT brain both) and other co-morbid conditions (Asphyxia, sepsis, RDS, PDA, hypoglycemia and hypocalcaemia). Descriptive statistics were calculated (mean and standard deviation for gestational age & weight and frequencies for data like sex, mode of delivery, signs and symptoms, age of presentation of IVH, grading of IVH, imaging technique used for confirmation of IVH and other co-morbid conditions).

RESULTS

The gestational age of the study cases, showed that most of children, 63% (n=63) presented between 30 to 35 completed weeks of gestation from the 1st day of last menstrual period. Out of the remaining babies, 20% presented between 35 to less than 37 completed weeks and 17% were less than 30 completed weeks (Table 1). Mean gestational age was 32.4±1.8 weeks. Most of these patients were male 62% (n=62) and remaining were females 38% (n=3%) with the male to female ratio of 1.6:1. Majority of neonates were very low birth weight (VLBW=41%) while 37% low birth weight (LBW), 13% extremely low birth weight (ELBW) and 09% were incredibly low birth weight (ILBW) (Table 2). The mean weight of

neonates was 1.6 ± 1.1kg. Mode of delivery for most of babies was normal vaginal delivery (41%). 18% babies were delivered by normal vaginal delivery with episiotomy, 22% through elective C-section and 19% babies delivered by emergency C-section.

Commonest presentation was lethargy (54%), followed by feeding difficulties in 47%, pallor in 41%, apnea in 38%, cyanosis in 19%, Fits in 16%, shrill cry in 11% and tense/bulging fontanel in 08% of cases (Table 3). Combination of symptoms was present in majority of the cases. For example, pallor and apnea were present in 33% of babies and pallor, lethargy and feeding difficulties in aggregate were present in 48% of babies with IVH.

Table 1: Gestational age of patients with prematurity

Age (completed weeks)	=n	%age
35 to less than 37	20	20
32 to less than 35	22	22
30 to less than 32	41	41
Less than 30	17	17

Table 2: Weight of preterm neonates

Weight (kg)	=n	%age
Low birth weight	37	37
Very low birth weight	41	41
Extremely low birth weight	13	13
Incredibly low birth weight	09	09

Table 3: Signs and symptoms of intraventricular hemorrhage

Neonatal risk factors	=n	%age
Lethargy	54	54
Reluctance to feed	47	47
Pallor	41	41
Apnea	38	38
Cyanosis	19	19
Fits	16	16
Shrill cry	11	11
Tense/bulging fontanel	08	08

Table 4: Age at which intraventricular hemorrhage developed

Age of developing IVH (day of life)	=n	%age
1 st	11	11
2 nd	02	02
3 rd	01	01
4 th	00	00
5 th	00	00
6 th	01	01
7 th	00	00

Table 5: Classification of intraventricular hemorrhage

Grade of IVH	=n	%age
I	09	09
II	03	03
III	01	01
IV	02	02

Out of study group 15% cases developed IVH, majority during the first 24 hours of life (11%), 02% on 2nd day, 01% on 3rd day and 01% on 6th day of life (Table 4). Out of these 15% patients who developed IVH, 09% developed grade I, IVH, 03% developed grade II, IVH, 01% grade III, IVH and 02% developed grade IV, IVH (Table 5). In 14% of patients with IVH, cranial ultrasonography was enough to diagnosed IVH, while in only 1% of patients CT was required to confirm the presence of IVH. All the preterm babies who developed IVH in my study had some co-morbid condition (05% of babies RDS. 04% had asphyxia, 02% had PDA, 01% had sepsis, 01% had hypoglycemia and 02% had hypothermia).

DISCUSSION

The frequency of IVH depends on gestational age. It increases progressively with decreasing age of presentation. In my study it was 80% in age less than 35 weeks of gestation.

Same conclusion was drawn in many studies. Like a study conducted by Khodapanahandeh F (including 82 preterms, data collection in retrospective manner)⁹. Incidence of IVH among LBW babies was 37% and in VLBW babies was 41%. There exists a significant relationship between birth weight and occurrence of IVH. In our study frequency of IVH increased by decreasing birth weight, also showing an inverse relationship. In a study on newborn by Kadri H (including 282 preterm), showed that incidence of IVH increases with decreased birth weight.⁽¹⁰⁾ Another study carried out by Linder N (number of preterm and study period were almost similar to our study)¹¹ showed same result as that of ours. His study showed that incidence of IVH was 45% in VLBW. Another study by Rana MN⁽¹²⁾ (same time duration as that of ours and data collection in prospective manner) showed inverse relationship of IVH and birth weight. Present study showed that 59% newborn with IVH delivered through vagina and 30% newborn with IVH, delivered with C/Section. There is decreased incidence of IVH with C/Section. Same results were shown by Badiie Z¹³ (included 112 preterm, study period was of thirteen month and data collection was also prospective), which showed C/Section had protected effect on occurrence of IVH.

Unlike our study a study carried by Haque KN found that there is no influence of mode of delivery on occurrence of IVH¹⁴ because his study included 213 patients, study period was longer (six years) and data collection was in retrospective manner.

Most common presentation of IVH in preterm neonates in our study was lethargy and reluctant to feed in 54% and 41% respectively followed by pallor and apnea. Similarly in a study conducted by

Chaudary Habibur Rasul³ (cross sectional study including 118 preterm with data collected in a prospective manner for fifteen months) showed that lethargy and refusal to feed were common symptoms. However Vohr BR in his study observed apnea and convulsion common symptoms¹⁵. This is because his study period was of longer duration as compared to ours and sample size was also large.

Present study showed that 11% IVH occurred in first 24 hours of birth, 2% within 42 hours of birth and 1% on 3rd day of life. Same results were shown by Chen CH found that 90% IVH occur in 1st 72 hours of life⁽¹⁶⁾. Their study included 147 preterm and it was a multi-center study.

Kleigman et al in their study found that IVH is rarely present at birth. 80 to 90% of cases occurred between birth and 3rd day of life. Their study showed that 50% cases occurred on the 1st day, this was in contrast to our study, which showed that 11% IVH occurred in first 24 hours of birth. This was because their study was multi-center and was of longer duration. Their study also showed that IVH was rare beyond 1st month of life¹⁷.

In our study most common form of IVH was found to be grade I hemorrhage 15% patient who develop IVH 9% develop grade I, 3% develop grade II, 1% grade III and 2% grade IV. A study conducted by Kadri H showed similar result in his study. He found that most of patient had grade I and grade II hemorrhages. His study period was almost similar to ours but he included 282 preterm.

Cranial ultrasound alone is diagnostic tool of choice for detection of IVH. In our study 14 cases of IVH were detected by cranial ultrasound and only one case required C.T scan for confirmation. Similarly, Debillion T, N Guyen S found in their study that cranial ultrasound is quiet effective in detecting CNS lesions in preterm neonates¹⁸. Their study design was prospective cohort and included 79 preterm neonates.

In our study most common co-morbid condition in preterm neonates who developed IVH was RDS followed by asphyxia. Babnik J, Stucin Gantar also found RDS and asphyxia most frequent co-morbid condition in their studies.⁽¹⁹⁾ Their study was prospective study similar to mine and included 125 preterm.

One limitation of my study was that long-term complication of IVH could not be followed-up. IVH is the commonest type of intracranial hemorrhage in preterm infants. In our study frequency of IVH was inversely related to birth weight and gestational age. Grade I was more common than other grades. IVH was observed in 1st 72 hours of life. Lethargy and refusal to suck were common symptoms in these

babies RDS and asphyxia were more frequent co-morbid condition with IVH.

CONCLUSION

Early identification of IVH is possible by clinical feature augmented by cranial ultrasonography. Anticipation and early identification of IVH can help predict mortality and morbidity in surviving infants. Present study was a single center study conducted on a limited number of patients. But it is probably still required on national and international levels to assess the frequency of IVH in preterm neonates, so that an effective strategy can be designed to monitor preterm neonates for early identification of this complication. Good antenatal and post natal care can change pattern of neonatal mortality. We must improve our antenatal and perinatal care to reduce mortality and morbidity in preterm neonates.

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