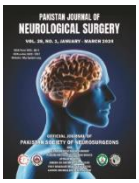

PAKISTAN JOURNAL OF NEUROLOGICAL SURGERY (QUARTERLY) – OFFICIAL JOURNAL OF PAKISTAN SOCIETY OF NEUROSURGEONS

Original Research

Frequency of Intraventricular Haemorrhage (IVH) in Early Preterm Neonates Born at DHQ Teaching Hospital Gujranwala

Azher Abbas Shah[1], Saima Umar[2], Aysha Ghayyur[3], Muhammad Arsalan Cheema[2], Zulfiqar Ali[2], Saqib Meraj Aslam Bajwa[4], Saman Shahid[5], Syed Shahzad Hussain[6]

[1]Department of Pediatrics, University of Child Health Sciences, the Children's Hospital, Lahore
[2]Department of Pediatrics, GMC Teaching Hospital, Gujranwala
[3]Department of Medicine, Jinnah Hospital, Allama Iqbal Medical College (AIMC), Lahore
[4]Department of Psychiatry, Punjab Institute of Mental Health, Lahore
[5]Department of Sciences & Humanities, National University of Computer & Emerging (NUCES), FAST Lahore Campus.
[6]Department of Neurosurgery, Punjab Institute of Neurosciences (PINS), Lahore – Pakistan

ABSTRACT

Objective: The reported frequency of intraventricular hemorrhage in preterm neonates varied greatly. We determined the frequency of IVH in premature neonates in the pediatric unit of DHQ Hospital Gujranwala.

Materials & Methods: This cross-sectional study involved 282 very low birth weight neonates (birth weight <1500 gm.) delivered very preterm (gestational age <32 weeks). These neonates were assessed for intraventricular hemorrhage which was diagnosed on cranial ultrasound performed on 3rd day of life. The frequency of IVH was compared across various attributing factors i.e., gestational age at delivery, gender, birth weight, mode of delivery, and maternal antenatal steroids.

Results: The mean gestational age at delivery was 27.5±2.3 weeks while the mean birth weight was 1120.5±190.2 grams. 172 (61.0%) neonates were delivered vaginally while C-section was performed in 110 (39.0%) cases. 263 (93.3%) mothers received antenatal steroids. Intraventricular hemorrhage was diagnosed in 64 (22.7%) early preterm neonates. The frequency of IVH increased significantly with increasing prematurity; 24-27 weeks vs. 28-31 weeks (28.9% vs. 17.0%; p-value=0.017), decreasing birth weight; <1 kg vs. ≥1kg (31.8% vs. 18.6%; p-value=0.014) and lack of antenatal steroids (52.6% vs. 20.5%; p-value=0.001).

Conclusion: The intraventricular hemorrhage was observed in 22.7% of early preterm neonates which advocates routine screening of preterm neonates for IVH so that timely identification and anticipated management may improve the outcome of such neonates. We also identified increasing prematurity, decreasing birth weight, and lack of antenatal steroids as potential attributing factors that can be used for risk stratification and management planning of such cases.

Keywords: Intraventricular Hemorrhage (IVH), Antenatal Steroids, Neonates, Low Birth Weight.

Corresponding Author: Saima Umar
Department of Pediatrics, GMC Teaching Hospital, Gujranwala
Email: drsaimaumar.111@gmail.com

Date of Submission: 10-09-2023
Date of Revision: 15-03-2024
Date of Acceptance: 25-03-2024
Date of Online Publishing: 31-3-2024
Date of Print: 31-3-2024

DOI: 10.36552/pjns.v28i1.968

INTRODUCTION

Premature birth rates continue to be a major public health concern. During the newborn stage, these babies have high rates of illness and mortality, which results in high medical expenses. Early-life survivors are typified by a range of health issues, including as lower IQs, behavior issues, respiratory illnesses, particularly asthma, and motor delay and/or cerebral palsy. Many people struggle academically, have worse health-related quality of life, and deal with stress from their families.[1-2] Intraventricular hemorrhage continues to be a significant cause of brain damage in extremely preterm children, even though more and more premature babies are surviving because of improved neonatal care and cutting-edge technologies. The long-term neurodevelopmental fate of such infants is significantly influenced by prevention, early detection, and appropriate care of IVH.[1-4]

Intraventricular hemorrhage is a serious neurological complication in premature babies. Intraventricular hemorrhage (IVH) affects 25-40% of babies less than 1500g weight of which 15% develop severe IVH. The subependymal germinal matrix, which vanishes with time, is where it starts. The growing brain's short-lived, metabolically dense subependymal germinal matrix. Intrinsic fragility of the germinal matrix vasculature and alterations in cerebral blood flow are pathophysiological factors of IVH. Multicenter studies show that the incidence of IVH is inversely related to gestational age. In VLBW (Very-low-birth-) newborns with IVH, post-hemorrhagic hydrocephalus develops in about 35% of cases. Additionally, there is a higher chance of behavioral and cognitive issues in these babies, such as attention deficit problems.[1-8] IVH was found to be 24.1% common in a prospective cross-sectional study conducted at Wesley Guild Hospital's special care infant unit. The incidence of intraventricular hemorrhage was 22.1 per 1000 live births in a study of 201 newborns in a tertiary care hospital in Karachi. Another study carried out between 2011 and 2013 at the Department of Neonatology, Poznan University of Medical Sciences, revealed that stage 3 and 4 intraventricular hemorrhage affected 56 out of 267 preterm babies under 32 weeks of gestation or 21% of the total.[2,7]

Various major risk factors other than low gestational age are low birth weight, premature rupture of membranes, mode of delivery, maternal smoking, resuscitation, intubation, early onset of sepsis, prolonged labor, and breech presentation.[8] These variables cause variations in cerebral blood flow, and when combined with the germinal matrix's innate fragility, they cause the vasculature to burst, causing bleeding and the ventricular system of the brain to fill with blood.[6] It is important for the pediatrician to know the frequency of intraventricular hemorrhage and early detection and intervention for better outcomes and prevention of life-threatening sequelae. 15 million preterm births occur each year, and the odds of these kids surviving differ significantly between countries. The primary brain injury that can happen to premature neonates' developing brains is called intraventricular hemorrhage, and it plays a significant role in determining the long-term neurological prognosis. The present investigation was necessary since the reported prevalence of intraventricular hemorrhage in preterm infants differed significantly among published studies and there was no local published information of this type. Finding out how often IVH occurs in preterm infants in the pediatric section at DHQ Hospital Gujranwala was the aim of this study.

The most common cause of newborn morbidity and death is intracranial hemorrhage (ICH). Many hereditary and acquired illnesses can

cause newborn ICH, although in many cases, no etiology can be determined. Because the newborn period is a key phase for brain development, trauma to the brain typically results in significant poor neurodevelopmental effects.[9] The neurodevelopmental outcomes of newborns with ICH are dictated by the brain's morphology, the location and size of the lesion(s), the underlying etiology, and the existence of other concurrent diseases. We divide the causes of newborn ICH into eight major categories: Prematurity-related hemorrhage, Bleeding diathesis, Genetic reasons, Infection, Trauma-related hemorrhage, Tumor-related hemorrhage, and Vascular malformations are all examples of vascular malformations.

MATERIALS AND METHODS

Study Design & Setting

A cross-sectional study was conducted at the Department of Pediatric Medicine, DHQ Hospital Gujranwala. The duration of the study was 6 months after the approval (reference # IRB 46/GMC) of the synopsis from the ethical review board of Gujranwala Medical College. The duration of the study was from 21/08/2019 to 20/02/2020.

Inclusion Criteria

Babies born before 32 weeks of gestation are confirmed by antenatal scans and weigh less than 1.5 kg of either gender.

Exclusion Criteria

Babies having any comorbid condition or congenital anomalies and babies not meeting the inclusion criteria were excluded from the study.

Data Collection Procedure

Preterm neonates before 32 weeks of gestation admitted to NNU were included in the study through consecutive sampling. Their cranial ultrasound was done on 3rd day of life. However, the preterm neonates with congenital defects like meningomyelocele and congenital heart disease were excluded. IVH was diagnosed as per the operational definition and was managed as per hospital protocols

Data Analysis Procedure

Written informed consent was obtained from the parents of every patient. All the collected data was entered and analyzed through SPSS version 25.0. Numerical variables; gestational age at delivery and birth weight have been presented by mean ±SD. Categorical variables i-e., gender of the newborn, maternal antenatal steroid use, mode of delivery, and IVH have been presented by frequency and percentage. A chi-square test was applied taking p value ≤0.05 as statistically significant.

RESULTS

Gestational Age Distribution

282 patients were included as per inclusion/ exclusion criteria. The gestational age at delivery ranged from 24 weeks to 31 weeks with a mean of 27.5±2.3 weeks, while the birth weight ranged from 813 grams to 1478 grams with a mean of 1120.5±190.2 grams.

Gender Distribution

There were 155 (55.0%) male and 127 (45.0%) female neonates with a male-to-female ratio of 1.2:1.

Clinical Information

172 (61.0%) neonates were delivered vaginally while C-section was performed in 110 (39.0%) cases. 263 (93.3%) mothers received antenatal steroids (Table 1).

Diagnosis of IVH

Intraventricular hemorrhage was diagnosed in 64

(22.7%) early preterm neonates (Table 2). The frequency of IVH increased significantly with increasing prematurity; 24-27 weeks vs. 28-31 weeks (28.9% vs. 17.0%; p-value=0.017), decreasing birth weight; <1 kg vs. ≥1kg (31.8% vs. 18.6%; p-value=0.014) and lack of antenatal steroids (52.6% vs. 20.5%; p-value=0.001). However, the frequency of IVH was comparable across various subgroups based on gender (p-value=0.814) and mode of delivery (p-value=0.763) (Table 1).

Table 1: Frequency of IVH across Various Subgroups of Early Preterm Neonates (n=282).

Subgroups	N	IVH n (%)	P-value
Gestational Age			
• 24-27 weeks	135	39 (28.9%)	0.017*
• 28-31 weeks	147	25 (17.0%)	
Gender			
• Male	155	36 (23.2%)	0.814
• Female	127	28 (22.0%)	
Birth Weight			
• <1 Kg	88	28 (31.8%)	0.014*
• ≥1 Kg	194	36 (18.6%)	
Mode of Delivery			
• Vaginal	172	38 (22.1%)	0.763
• C-Section	110	26 (23.6%)	
Antenatal Steroids			
• Yes	263	54 (20.5%)	0.001*
• No	19	10 (52.6%)	

Chi-square test, * observed difference was statistically significant

Table 2: Frequency of IVH in Early Preterm Neonates (n=282).

Intraventricular Hemorrhage	Frequency (n)	Percentage (%)
Yes	64	22.7%
No	218	77.3%
Total	282	100.0%

DISCUSSION

In the present study, the mean gestational age at delivery of early preterm neonates was 27.5±2.3 weeks. Our observation is in line with that of Al-Mouqdad et al,[10] also observed similar mean gestational age at delivery among Saudi early preterm neonates and reported it to be 27.8±2.4 weeks. A similar mean gestational age at delivery of 27.9±2.1 weeks has also been reported by Henderson et al,[11] in the UK. Chiruvolu et al,[12] observed similar mean gestational at delivery among American preterm neonates and reported it to be 27.9±2.4 weeks. Comparable mean gestational age at delivery of 26.5±1.8 weeks and 25.8±1.7 weeks has also been reported by two other US studies by Alan et al[13] and Siddappa et al,[14] respectively. Bassiouny et al,[15] reported a similar mean gestational age of 28.0±2.9 weeks in Oman.

In this study, there were 155 (55.0%) male and 127 (45.0%) female neonates with a male-to-female ratio of 1.2:1. Similar male predominance among early preterm neonates has also been observed by Khan et al,[16] who reported a male to female ratio of 1.3:1 at Fauji Foundation Hospital, Rawalpindi. Our observation is in line with that of Siddappa et al,[14] who also observed similar male predominance and reported a male-to-female ratio of 1.2:1 among American preterm neonates. Chiruvolu et al,[12] (1.2:1) in the USA, Hoque et al,[17] (1.3:1) in Bangladesh, and Egwu et al,[18] (1.4:1) in Nigeria also observed similar male predominance among preterm neonates.

In this study, the mean birth weight of early preterm neonates was 1120.5±190.2 grams. Haroon et al.[8] (2014) in a similar local study reported a comparable mean birth weight of 1170.9±394 grams among early preterm neonates at The Aga Khan University Hospital, Karachi. Our observation is also in line with that of Yakoob et al,[19] also reported a similar mean birth weight of 1042±304 grams among very preterm neonates born at The Aga Khan University Hospital Karachi. Bassiouny et al,[15] reported a similar mean birth weight of 1131±170.2 grams among such neonates in Oman. Chiruvolu et al,[113] reported a comparable mean birth weight of 1155±399 grams in the USA while Hochart et al,[20] reported it to be 1145 grams in France. Comparable mean birth

weights of 1064±264 grams and 1018±246 grams have also been reported by Henderson et al,[11] in the UK and Al-Mouqdad et al,[10] (2019) in KSA respectively.

In the present study, 172 (61.0%) early preterm neonates were delivered vaginally while C-section was performed in 110 (39.0%) cases. A similar distribution of vaginal (61.0%) and cesarean (39.0%) modes of delivery among preterm neonates have also been reported by Sabir et al,[21] at Pakistan Navalship Shifa Hospital Karachi. Shahid et al,[22] reported similar frequency of 64.3% and 35.7% for vaginal and cesarean delivery respectively among preterm neonates. Our observation is also in line with that of Wagura et al,[23] reported the frequency of vaginal and cesarean delivery among preterm neonates to be 61.0% and 39.0% respectively in Kenya. Henderson et al,[11] reported similar frequency of 60.9% and 39.1% for vaginal and cesarean delivery among preterm neonates in the UK while Al-Qa'Qa et al,[24] (2005) reported these frequencies to be 64.0% and 36.0% respectively in Jordan.

In the present study, 263 (93.3%) mothers received antenatal steroids. Our observation is in line with that of Chiruvolu et al,[12] who also reported a similar frequency of 93.3% for antenatal steroids in mothers of preterm neonates in the USA while Henderson et al,[112] observed it to be 90.9% in the UK. Egwu et al,[18] reported this frequency to be 95.0% in Nigeria. A relatively lower frequency of 87.0% has been reported by Hochart et al.[20] in France.

In the present study, intraventricular hemorrhage was observed in 22.7% of early preterm neonates which advocates routine screening of preterm neonates for IVH so that timely identification and anticipated management may improve the outcome of such neonates. We identified increasing prematurity, decreasing birth weight, and lack of antenatal steroids as potential attributing factors that can be used for risk stratification and management planning of such cases. A similar frequency of IVH (22.1%) has been reported previously by Haroon et al,[8] (2014) who studied 201 preterm neonates. Hochart et al,[20] reported a similar frequency of 23.0% for IVH among French preterm neonates. A relatively lower frequency of 21.0% has been reported by Larroque et al,[25] (2003) in another French study. Our results are also in line with those of Adegoka et al,[7] (2014) who reported a similar frequency of 24.1% for IVH in preterm neonates in Nigeria.

We observed that the frequency of IVH increased significantly with increasing prematurity; 24-27 weeks vs. 28-31 weeks (28.9% vs. 17.0%; p-value=0.017), decreasing birth weight; <1 kg vs. ≥1kg (31.8% vs. 18.6%; p-value=0.014) and lack of antenatal steroids (52.6% vs. 20.5%; p-value= 0.001). A similar relationship between IVH and lack of maternal steroid use (30.0% vs. 7.0%) has also been reported by Batool et al,[26] at Fatima Memorial Hospital, Lahore. Our observation is in line with that of Siddappa et al,[14] (77% vs. 57.0%), Al-Mouqdad et al,[10] (63.9% vs. 45.4%), and Egwu et al,[18] (100.0% vs. 0.0%) reported a similar higher frequency of IVH with lack of antenatal maternal steroids. Kapoor et al,[27] (2018) reported a similar significant difference in the frequency of IVH with birth weight; <1 Kg vs. ≥1 Kg in line with the present study.

Limitations

This present study was a cross-sectional study design so we didn't consider the neurodevelopmental outcome as well as the mortality of these neonates which would have required long-term follow-up. However, this information would have helped further in the management planning of these cases.

CONCLUSION

It is recommended that preterm newborns be routinely screened for intraventricular hemorrhage (IVH) to enhance the prognosis of these neonates. 22.7% of early preterm neonates had IVH. We have

determined that there is a possible correlation between rising preterm, falling birth weight, and the absence of prenatal steroids that may be utilized in risk assessment and case management.

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Additional Information

Disclosures: Authors report no conflict of interest.
Ethical Review Board Approval: The study was approved by the ethical review board.
Human Subjects: Consent was taken from all patients/participants in this study.
Conflicts of Interest:
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
Other Relationships: All authors have declared that there are no other contacts or activities that could appear to have influenced the submitted work.
Data Sharing Statement: For data sharing, interested researchers can contact the corresponding authors.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Azher Abbas Shah, Muhammad Arsalan Cheema, & Saima Umar	1. Study design, methodology & paper writing.
2.	Zulfiqar Ali, Saman Shahid, Arsalan Cheema, & Saima Umar	2. Data collection and calculations.
3.	Saqib Meraj Aslam Bajwa, Arsalan Cheema, & Saima Umar	3. Analysis of data and interpretation of results.
4.	Aysha Ghayyur, & Zulfiqar Ali	4. Literature review and referencing.
5.	Saman Shahid, & Syed Shahzad Hussain	5. Editing and quality insurer.