

Frequency of Intraventricular Hemorrhage in Premature Neonates According to Mode of Delivery

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Intraventricular Hemorrhage in Premature Neonates

ABSTRACT

Objective: To determine frequency of intraventricular hemorrhage in premature neonates according to mode of delivery.

Study Design: Descriptive/ cross-sectional study.

Place and Duration of Study: This study was conducted at the Pediatric Medicine Department, DHQ Hospital Faisalabad from 12.05.2011 to 11.11.2011.

Materials and Methods: This study included 300 premature neonates. The neonates were divided in two separate groups. In the 1st group, neonates born with vaginal delivery and the 2nd group, neonates born with cesarean section were included. All the patients were evaluated for the presence of IVH which was described as frequency distribution table. Data was collected in a specially designed proforma.

Results: The mean gestational age of the neonate in the study was 29.81 ± 3.36 weeks including 177 (61%) male and 123 (39%) female. Total 67 (22.3%) infants had IVH. 19 (10.7%) patients in cesarean section group and 48 (39%) neonates in the other group developed IVH, showing significant differences ($p < 0.05$).

Conclusion: The frequency of IVH is low among neonates born with cesarean section as compared to those born with vaginal delivery.

Key Words: Premature infants; intraventricular hemorrhage; cesarean section; vaginal delivery.

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INTRODUCTION

Delivery before 37 weeks from first day of last menstrual period is called prematurity delivery.¹ The incidence of prematurity in Pakistan is not known with certainty, but it is estimated as 11-13%.² Respiratory distress syndrome, infections, necrotizing enterocolitis, patent ductus arteriosus, intraventricular hemorrhage, and other signs of brain injury as apnea and bradycardia are among the acute complications of prematurity.^{3,4} Intraventricular hemorrhage (IVH) is most often seen in premature babies⁵. Intraventricular hemorrhage can be defined as intracranial hemorrhage that originates in the periventricular subependymal germinal matrix with subsequent entrance of blood into the ventricular system⁴.

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It is reported that approximately 12,000 premature infants develop intraventricular hemorrhage every year in the United States alone⁶. The incidence of IVH in very low birth weight (VLBW) infants (<1500 g) has declined from 40 to 50% in the early 1980s to 20% in the late 1980s⁷. However, in the last two decades the occurrence of IVH has remained stationary⁸.

Incidence of intraventricular hemorrhage is inversely proportional to gestational age, but the prevalence of germinal matrix intraventricular hemorrhage is approximately 47.5%⁹. In extremely premature infants weighing 500–750 g, IVH occurs in about 45% of neonates⁸. Thus, IVH continues to be a major problem of premature infant in modern neonatal intensive care units (NICUs) worldwide.

Intraventricular hemorrhage (IVH) is an important cause of morbidity and mortality in preterm infants¹⁰. More than 50% of bleeding episodes occur during the first 24 hours of life, with <5% occurring after day 4 and 5. Although the incidence of IVH is decreasing¹¹, it remains a serious problem in the VLBW infant. It is classified into four groups i-e Grade I, II, III and IV, and higher the grade more severe is the bleeding. Signs and symptoms vary, child may be asymptomatic especially in some cases of Grade I and II IVH, but may present with apnea, pallor, poor muscle tone, decreased reflexes, excessive sleep, lethargy, weak suck, bulging fontanel and coma. A number of risk factors have been proposed for the development of IVH. Low birth weight and

gestational age, maternal smoking, breech presentation, gender, premature rupture of membranes,^{11,12} intrauterine infection, prolonged labour, postnatal resuscitation and intubation, early onset of sepsis, metabolic acidosis, and high-frequency ventilation, respiratory distress syndrome, pneumothorax¹² are some named risk factors.

Beside, other commonly cited risk factors, that alter the risk for intraventricular hemorrhage, include mode of delivery, maternal hypertension, premature or prolong rupture of membranes, maternal fever and bleeding, prenatal steroid administration, maternal magnesium sulphate (MgSO₄) therapy, and that in neonate, 1 and 5 mints Apgar scores, need for delivery room resuscitation, sepsis, use of high frequency ventilation, pneumothorax and patent ductus arteriosus⁷.

Clinical presentation is variable may be asymptomatic or may present with bulging fontanell, sudden pallor, apnea, bradycardia, acidosis, seizures, change in muscle tone or level of consciousness¹³. Diagnosis of intraventricular hemorrhage is made on the basis of clinical assessment and cranial ultrasonography.^{5,6} Management is mostly supportive and may include the correction of anemia, acidosis, and hypotension¹⁴.

The cause of intraventricular hemorrhage is multi factorial but stress of labour is considered as one of the contributing factors and the rate of the intraventricular hemorrhage is 7.7% for cesarean delivery and 13.6% in vaginal delivery¹⁵ and in other study the rate of intraventricular hemorrhage was 33% for vaginal delivery and 67% for cesarean delivery¹⁶. However the role of mode of delivery in occurrence of intraventricular hemorrhage is unclear.

The rationale of present study is to determine the occurrence of intraventricular hemorrhage in premature neonates delivered by normal vaginal delivery and c-section, which will be helpful in choosing the safest modes of delivery to reduce mortality and long term morbidities of intraventricular hemorrhage in premature neonates.

MATERIALS AND METHODS

This Descriptive case series was carried out at Paediatric Medicine Department, DHQ Hospital Faisalabad, in six month duration, from 12/05/2011 to 11.11.2011.

By using WHO sample size calculator, a total of 300 samples were calculated.

- Prevalence of intraventricular hemorrhage = 7.7%
- Absolute precision required = 3%
- Confidence level = 95%
- Sample size = 300

Sampling Technique: Non-Probability, Purposive Sampling

Sample Selection: Samples were selected, using the following inclusion and exclusion criteria.

Inclusion Criteria

- Premature infants of either sex
- Age limit first 3 days.

Exclusion Criteria

- Infants who had congenital cranial abnormalities

- Infants who died within 3 days

Data Collection Procedure: After taking approval from hospital ethical committee, children of either sex presenting with prematurity below 34 weeks in Neonatology Unit were enrolled. Exclusion criteria were strictly followed to control confounding variables. The purpose, procedure, risks and benefits were explained to the parents of children and informed consent was taken. Inclusion and exclusion criteria were met by taking history and by examining the patients. After detailed history and examination, data was registered as per proforma. Ultrasound cranial was done on 3rd day of admission by radiologist in radiology department DHQ Hospital Faisalabad. All the information were recorded on proforma and mode of delivery was confirmed on the basis of history.

Data analysis Procedure: Data was entered and analysed by using SPSS V-16 and level of significance was determined. Descriptive statistics was calculated for all variables. Mean and standard deviation were calculated for all quantitative variables like age (in days) and gestational age (at which is delivered). Frequency and percentage were calculated for all qualitative variables like gender, intracranial hemorrhage and grades of hemorrhage and mode of delivery. Frequency was calculated for intraventricular hemorrhage based on mode of delivery.

RESULTS

The results of the study are tabulated at tables 1-4 and figures I-2.

Distribution of patients by Gestational age: The mean gestational age of the premature neonates was 29.81 ± 3.36 weeks. [Range 26 – 36]. There were 14 (4.6%) premature neonates of gestational age 26 weeks, 26 (8.7%) neonates of age 27 weeks, 29 (9.7%) neonates of gestational age of 28 weeks, 37 (12.3%) neonates of age 29, 25 (8.3%) of gestational age of 30 weeks, 26 (8.7%) neonates of age 31 weeks, 30 (10%) patients of gestational age 32 weeks, 36 (12%) patients of age 33 weeks, 23 (7.7%) patients of age 34 weeks, 21 (7%) patients of gestational age 35 weeks and 33 (11%) patients of gestational age 36 weeks. (Table 1)

Distribution of patients by sex: There were 177 (59%) male neonates and 123 (41 %) female neonate in the study. The male to female ratio was 1.44:1.

Distribution of patients by Intraventricular hemorrhage: Among the 300 premature neonates in the study, Intraventricular hemorrhage was present among 67 (22.3%) premature infants, while this was absent among 233 (77.7%) neonates. (Figure 1)

Distribution of patients by age of development of IVH: There were 67 neonates who developed IVH. There were 26 (38.8%) neonates who developed IVH during 1st day of life, 19 (28.4%) neonates who developed IVH during 2nd day of life and 22 (32.8%) neonates who developed IVH during 3rd day of life. (Table 2).

Distribution of patients by Grading of IVH: Of the 67 patients in the study, there were 29 (43.4%) neonates who had developed IVH of Grade I, 15 (22.4%) neonates who had IVH of grade II, 14 (20.8%) neonates who had grade III and 9 (13.4%) patients who developed IVH of grade IV. (Table 3)

Distribution of neonates by mode of delivery: There were 123 (41%) mothers who delivered their baby by vaginal delivery while 177 (61%) had cesarean section. Figure II)

Table No.1: Distribution of patients by age (n=300)

| Gestational Age (weeks) | No. of patients | Percentage |
|-------------------------|-----------------|------------|
| 26 | 14 | 4.6 |
| 27 | 26 | 8.7 |
| 28 | 29 | 9.7 |
| 29 | 37 | 12.3 |
| 30 | 25 | 8.3 |
| 31 | 26 | 8.7 |
| 32 | 30 | 10 |
| 33 | 36 | 12 |
| 34 | 23 | 7.7 |
| 35 | 21 | 7 |
| 36 | 33 | 11 |
| Mean + SD | 29.81 ± 3.36 | |
| Range | 26 – 34 | |

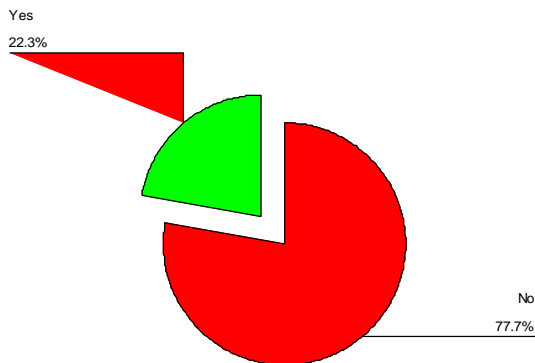


Figure No.1: Distribution of neonates by intraventricular hemorrhage (n= 300)

Table No.2: Distribution of patients by age of development of IVH (n = 67)

| Age of developing IVH | No. of patients | Percentage |
|-----------------------|-----------------|------------|
| 1 st day | 26 | 38.8 |
| 2 nd day | 19 | 28.4 |
| 3 rd day | 22 | 32.8 |

Cross tabulation of neonates with IVH with mode of delivery: Of the 177 neonates born to the mothers who had cesarean section, IVH developed in 19 (10.7%) neonates, while 158 (89.3%) infants did not developed IVH. Among the 123 neonates born through par vaginal

route, IVH was present among 48 (39%) neonates, while 75 (61%) neonates did not suffer from IVH. study, The two groups were compared with each other for any statistical significance. Chi – square test was applied. P value was 0.000 (significant). (Table 4)

Table No.3: Distribution of patients by grade of IVH (n=67)

| Grades of IVH | No. of patients | Percentage |
|---------------|-----------------|------------|
| G – I | 29 | 43.4 |
| G – II | 15 | 22.4 |
| G – III | 14 | 20.8 |
| G - IV | 9 | 13.4 |

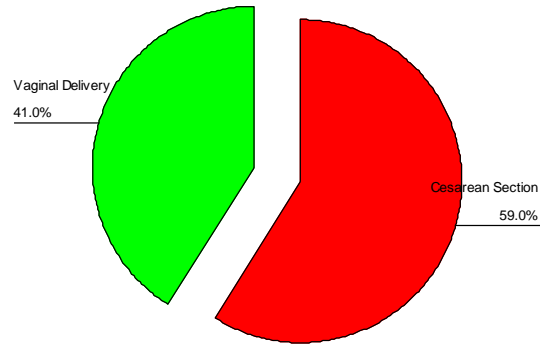


Figure No.2: Distribution of patients by mode of delivery (n=300)

Table No.4: Cross tabulation of neonates with IVH with mode of delivery (n=67)

| Intraventricular hemorrhage | Mode of delivery | | | |
|-----------------------------|--------------------------|------|----------------------------|----|
| | Vaginal delivery (n=177) | | Cesarean section (n = 123) | |
| | No. | % | No. | % |
| Yes | 19 | 10.7 | 48 | 39 |
| No | 158 | 89.3 | 75 | 61 |
| P-value | 0.000* | | | |

* Chi – square test

DISCUSSION

Intraventricular hemorrhage is a major neuropathologic lesion in premature infants. Since, prematurity have shown significant association with IVH, this study was conducted with the aim to determine the frequency of IVH among premature infants according to its mode of delivery. The overall frequency of IVH was 22.3%. The results of this study showed that IVH among neonates born with cesarean section was 10.7% while that with vaginal delivery was 39%.

Few studies have been reported which have determined the frequency of IVH among premature infants. However, the frequency of IVH varies among different authors. Sonkusare S, *et al*¹⁷ performed a study which included a total of 113 pregnant women and 124 neonates who delivered from 30 to 35 weeks of

gestation were enrolled and outcomes of 70 neonates born vaginally were compared to 54 neonates born by caesarean. They found that IVH occurred in 1.4% neonates with vaginal delivery while 3% in neonates with cesarean section. They found and observed a higher frequency of IVH with vaginal delivery, but the difference was not significant and the sample size of the study was too short. However, in another study of larger scale by Heuchan *et al*,⁶ among 5712 infants of 24-30 weeks gestation. They found IVH more common (19%) in SVDs as compared to LSCS which was found to be 11%.

Sabir S, *et al*¹⁸⁻¹⁹ conducted a study in which 100 preterm babies were included. Mean gestational age was 32.3 weeks (SD=2.12). Maximum number of the patients (70%) was in the age group of 30 weeks of gestation. Mean birth weight of the babies was 1637.7gm (SD=349.25) and male to female ratio was 1:1. Sixty-one (61%) of babies were delivered by SVD, while 39 (39%) babies were born by LSCS. Intraventricular hemorrhage was diagnosed among 11% cases of IVH in 100 preterm babies. IVH was detected in 7 babies on third day of life, while in rest of 4 babies on day 7. However, none of the patients in our study was found having IVH at 7th day of life. Mode of delivery affects frequency of IVH and we found IVH more common (13%) in babies delivered by SVD as compared to (7.6%) babies delivered by LSCS.

Present study showed that 38.8% IVH occurred in first 24 hours of birth, while no much difference was observed in other two days, i.e. 28.4% and 32.8% in 2nd and 3rd day. Chen HJ in their multi-centre study, having 147 preterm found that 90% IVH occur in 1st 72 hours of life¹⁹, which is much higher as reported in our study.. Kleigman *et al*²⁰ 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, while our study showed that 38.8% neonates had IVH in first 24 hours of birth. Their study also showed that IVH was rare beyond 1st month of life.

A study was conducted by Sajjadian N, *et al*²¹ which included 57 infants who were born premature. The prematurity was defined if the birth weight was less than 1500 grams or gestational age was less than 37 weeks. They found that IVH was common among 61.4% patients. This was quite higher than our study i.e. 22.3%. Forty percent of patients with intraventricular hemorrhage had grade I, 11% grade II, 25.7% grade III, 2.8% grade VI. These results have some similarity with our results i.e. grade I IVH was the most common and was seen among 43.4% patients, followed by grade II in 22.4%.

CONCLUSION

This study concludes that frequency of IVH was found to be high among premature infants. So, it should be

detected among all patients with prematurity. Moreover, the frequency of IVH was high among neonates born with vaginal delivery as compared to cesarean section. So, a cesarean section should be offered to the mother with premature fetuses.

Author's Contribution:

| | |
|----------------------------|------------------------|
| Concept & Design of Study: | Sami ul Haq |
| Drafting: | Samiullah |
| Data Analysis: | Hazrat Bilal Khan |
| Revisiting Critically: | Samiullah, Sami ul Haq |
| Final Approval of version: | Sami ul Haq |

Conflict of Interest: The study has no conflict of interest to declare by any author.

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