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## To study the incidence of intraventricular Hemorrhage in preterm neonates

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### Abstract

**Introduction:** Intraventricular Haemorrhage is the most common forms of brain injury in preterm neonates<sup>1</sup>, more commonly seen in the smallest and most preterm neonates contributing to mortality, morbidity during the time of stay in hospital. IVH among VLBW is common with the incidence of around 20-25% out of which around 2/3<sup>rd</sup> are mild to moderate in severity with [grade 1-2].

**Objective:** To study the incidence of intraventricular hemorrhage in preterm neonates.

**Methods:** This is a hospital based, prospective, observational study. Total 100 inborn preterm neonates fulfilling the inclusion criteria were screened for IVH using USG cranium as modality of choice.

**Results:** Distribution of study subjects as per IVH on USG showed 86% of the preterm neonates did not have Intra ventricular hemorrhage while the rest 14% had Intra ventricular Hemorrhage (IVH). Among those 14 neonates who had IVH, 11 neonates (78.6%) had Grade – I IVH and the remaining 21.4% had Grade– II IVH.

**Conclusion:** On the basis of our present study the prevalence of IVH among preterm neonates in the present study was high (14%). Majority of them had grade I IVH. It was particularly high among those of gestational age  $\geq$  30 weeks. Apnea has a significant association with presence of IVH.

**Keywords:** IVH, PVL, VLBW, ELBW, GMH, apnea, USG Cranium

### 1. Introduction

Intraventricular Haemorrhage is one of the most common forms of brain injury in preterm neonates<sup>[1]</sup>, more commonly seen in VLBW, ELBW neonates and most preterm neonates contributing to mortality, morbidity. IVH is more common in VLBW than ELBW neonates with incidence among VLBW around 20-25% out of which around 2/3<sup>rd</sup> is mild to moderate in severity with [grade 1-2]<sup>[2]</sup>.

Birth weight	Incidence of Intraventricular hemorrhage
501-750g	25%
751-1000g	14%

The germinal matrix is the main site for IVH in preterm neonates which is located between the caudate and thalamic nuclei and this centre begins to involute after 34 weeks of gestation<sup>[3]</sup>. The most common etiology for IVH in the term new-born is perinatal asphyxia, venous thrombosis, trauma due to injury during birth. According to one of the studies IVH might occur from a result of venous hemorrhagic infarction in the thalamic region in approximately 63% of otherwise healthy term newborns with a prominent IVH<sup>[4]</sup>. Major etiologies include maternal factors infection/inflammation and haemorrhage, lack of antenatal steroids to the mother before delivery in preterms, external factors such as mode of delivery or neonatal transport to another hospital<sup>[5]</sup>. GMH/IVH is found with a higher incidence in preterm newborns born with a longer duration of labour and in those delivered vaginally as compared to one's born via caesarean section. The role of a pressure passive cerebral circulation is important amongst the above-mentioned reasons as well<sup>[6, 7]</sup>. Several studies have shown that there is an impaired ability to regulate CBF in response to blood pressure changes (hence "pressure-passive") in asphyxiated newborns amongst especially the preterm newborns<sup>[8, 9]</sup>. Seizures, hypercarbia, anaemia, and hypoglycaemia causes significant and sustained increase in CBF which may also lead to GMH/IVH<sup>[8, 9]</sup>.

Complications of GMH/IVH: Periventricular haemorrhagic infarction (PVHI) and post

haemorrhagic ventricular dilation (PVD) are the two major complications of GMH/IVH. Larger the size of IVH proportionally the complications increase for IVH [10, 11]. After a few days to weeks of GMH/IVH, Progressive PVD or posthemorrhagic hydrocephalus may occur [12, 13].

C. Clinical presentation: Since majority of hemorrhages occur within 72 hours after birth, routine CUS should be

performed within 3 to 4 days after birth (GA < 32 weeks) and the neonates can present with seizures, apnea, irritability or lethargy, vomiting with dehydration, or a full fontanelle are the signs seen in term newborns with IVH. Splitting of sutures, feeding difficulties, increasing head growth, bulging fontanelle, or impaired upgaze or sunsetting sign are the signs seen in newborns with PVD.

**Table 1:** Grades of Intraventricular hemorrhage

Grades of IVH	
1	Hemorrhage in subependymal germinal matrix without any blood clot in ventricular lumen
2	10-50% of lateral ventricles occupied by haemorrhage without leading to any ventricular enlargement
3	Ventriculomegaly present along with >50% of lateral ventricles being occupied by the haemorrhage.
4	IVH when associated with ipsilateral parenchymal haemorrhage leading to a complication called as Periventricular haemorrhagic infarction. <sup>3</sup>

Progression of IVH: [14, 15, 16]

**Table 2:** Distribution of IVH as per day of PNL and birth weight

Time since birth	
Day 1 of PNL	50%
Day 2 of PNL	25%
Day 3 of PNL	15%
A single scan on day 3 and day 4	90%
Neonates with 500 -750 g of birth weight	75% of IVH occurs on day 1

Sensitivity of cranial USG scan is 100% and specificity of cranial USG scan for hemorrhage detection is around 91% for detection of any haemorrhage which is >5mm though the sensitivity and specificity for PVL diagnosis is less.<sup>17</sup>

**Aims and Objectives:** To study the incidence of Intraventricular hemorrhage amongst preterm neonates at Maharishi Markandeshwar Hospital, Mullana, Ambala.

**Materials and Methods**

**Study Design**

This was a prospective observational study which was carried out in neonatal division of department of pediatrics Mmimsr, Mullana.

**Sample Size:** 100

**Durations:** one and half year

**Inclusion Criteria**

1. All preterm neonates <37 weeks of gestation. Eligible neonates delivered and admitted at tertiary care centre, mullana born with period of gestation <37 weeks.
2. Study group included both inborn and outborn babies at our hospital.

**Exclusion Criteria**

1. Neonates with major neurological congenital malformations/genetic anomalies.
2. Non consenting parents/guardians

**Observations and Results**

In our present study the mean birth weight of the neonates is 1.72 kg with male preponderance, the mean maternal age is 29.75 years ranging from 24 years to 41 years of age. 71% of the mothers did not receive antenatal care (Unbooked) and the rest received antenatal care Majority of the mothers (44%) are primigravida and the frequencies gradually decrease as the gravida increases. 2% were in the G6

category. 50% study subjects had normal vaginal delivery, 41% study subjects had elective LSCS, whereas 9% study subjects had emergency LSCS. 33% of study subjects had birth asphyxia 86% of the preterm neonates did not have Intra ventricular hemorrhage while the rest 14% had Intra ventricular Hemorrhage (IVH). Among those 14 neonates who had IVH, 11 neonates (78.6%) had Grade – I IVH and the remaining 21.4% had Grade–II IVH. In our present study 25% of the preterm female neonates had problems of Apnea and among males also 25% apnea problems. With significant difference having p value. In our present study among the neonates who did not show IVH on USG, 11.6% had Moderate APGAR score at 5 mins. In the neonates who had IVH on USG, 50% of the neonates showed APGAR Score at 5 mins with significant association having p value 0.002. In this study out of 11 neonates with grade I IVH, 7 subjects had APGAR score 7-10, and 4 subjects had APGAR score 4-6, whereas all 3 subjects with grade 2 IVH, all of them had APGAR 0-3, ON APPLYING CHI-SQUARE there is non-significant association with p value 0.096.

- In our present study in the neonates did not have IVH, 16.3% presented with symptoms of apnea, whereas in those who had IVH, 78.6% had apnea as well. On comparing there is significant association with p value <0.001. On USG In the neonates did not have IVH, 9.3% had PDA, whereas in those who had IVH, 50% had PDA. On comparing there is significant association with p value <0.001. In the present study Among the Grade–I IVH neonates, majority (63.6%) has Normal Vaginal Delivery and 18.2% had emergency LSCS delivery. In Grade–II IVH neonates (only 3 cases presented with this impression) all were born via NVD. On comparing there is non-significant difference with p value 0.466. 54.5% of the Grade–I IVH population had birthweight less than 1 kg, 18.2% were of 1 to 1.5 kg and the rest greater than 1.5 kg. In Grade–II IVH cases, there were only 3 neonates
- Distribution of study subjects as per IVH on USG

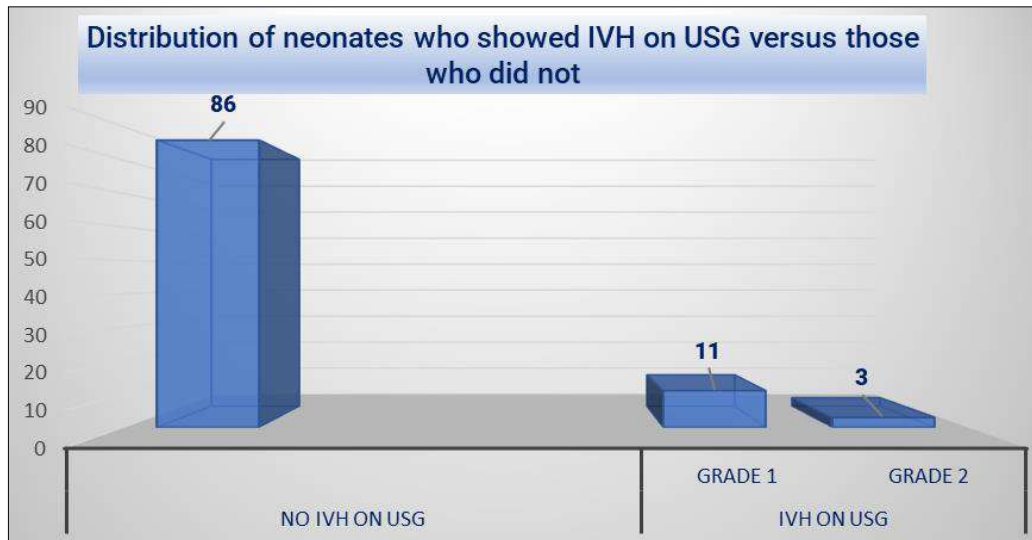
**Table 3:** Distribution of IVH on USG

IVH on USG	Frequency	Percentage
NO	86	86%
YES	14	14%
Total	100	100%

**Table 4:** Distribution of IVH as per grades

IVH on USG	Frequency	Percentage
GRADE 1	11	78.6%
GRADE 2	3	21.4%
Total	14	100%

Table shows Distribution of study subjects as per IVH on USG. 86% of the preterm neonates did not have Intra ventricular hemorrhage while the rest 14% had Intra ventricular Hemorrhage (IVH). Among those 14 neonates who had IVH, 11 neonates (78.6%) had Grade – I IVH and the remaining 21.4% had Grade – II IVH.

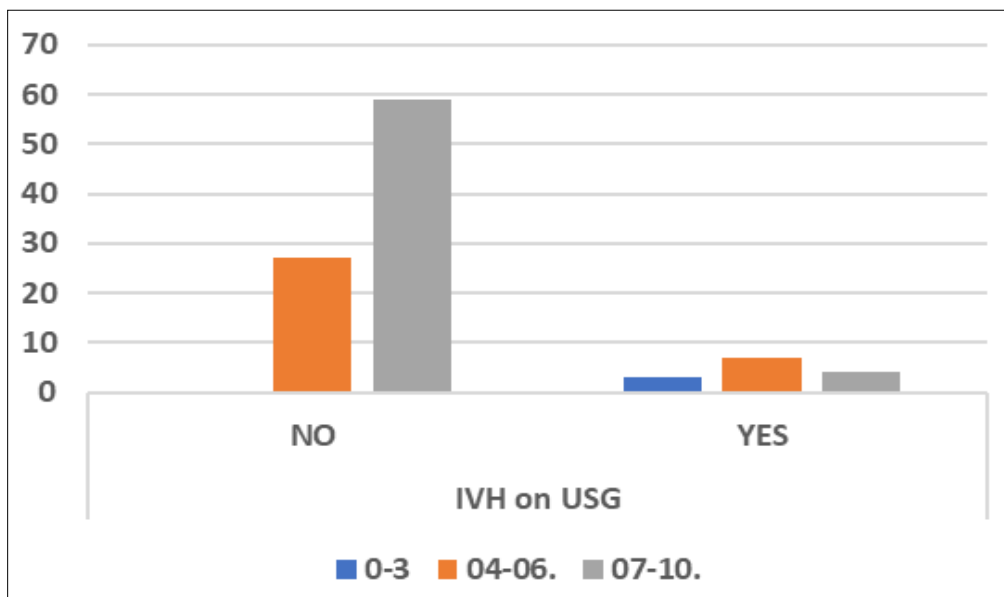


**Fig 1:** Distribution of study subjects as per IVH on USG

**Table 5:** Association of APGAR with IVH

APGAR at 1 min	IVH on USG		p-value
	NO	YES	
0-3	0 (0%)	3 (21.4%)	<0.001
4-6	27 (31.4%)	7 (50%)	
7-10	59 (68.6%)	4 (28.6%)	
Total	86 (100%)	14 (100%)	

Tab shows Association of APGAR at 1 min with IVH on USG, all 3 subjects with APGAR score 0-3 had IVH on USG, out of 34 subjects with APGAR score 4-6, 7 subjects had IVH whereas out of 63 study subjects with APGAR score 7-10, 4 subjects had IVH on USG, on comparing there is significant difference with p value <0.001.

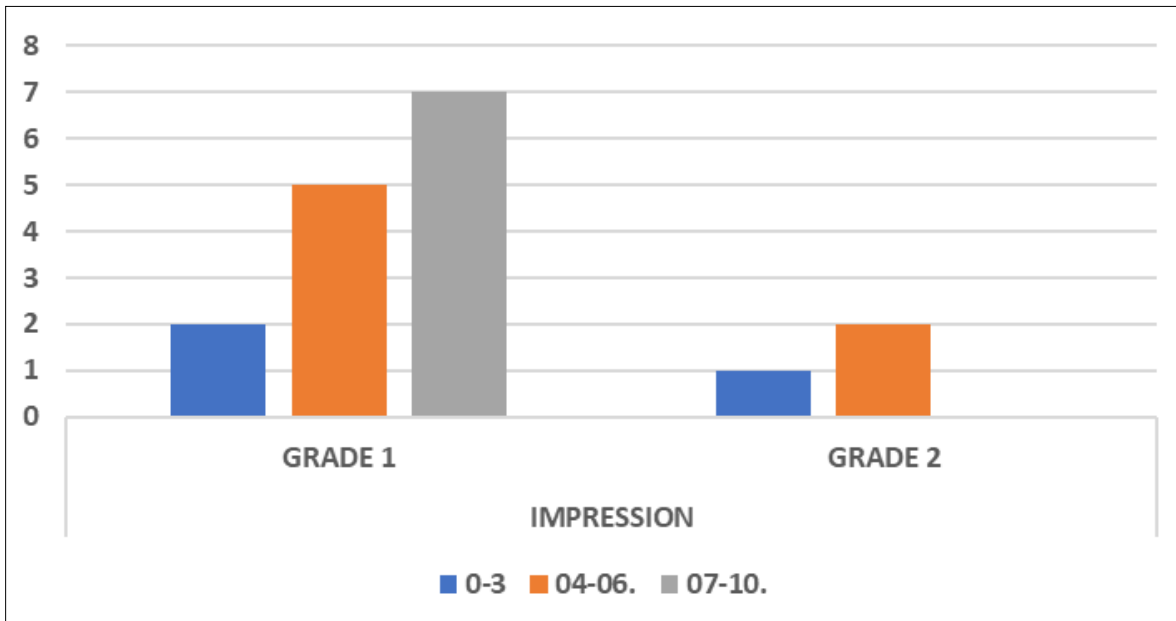


**Fig 2:** Association of APGAR at 1 min with IVH on USG

**Table 6:** Association of APGAR at 1 min with IVH on USG

APGAR at 1 min	IMPRESSION		p-value
	GRADE 1	GRADE 2	
0-3	2 (18.2%)	1 (33.3%)	0.459
4-6	5 (45.5%)	2 (66.7%)	
7-10	7 (36.4%)	0 (0%)	
Total	11 (100.0%)	3 (100.0%)	

Tab shows Association of APGAR at 1 min with grade of IVH on USG, out of 3 subjects with APGAR 0-3, 2 subjects had grade I, impression whereas 1 subjects had grade II impression. Out of 7 study subjects with APGAR score 4-6, 5 subjects had grade I IVH whereas 2 subject had grade II IVH, all 7 subjects had grade I IVH, on comparing there is non-significant association with p value 0.46.

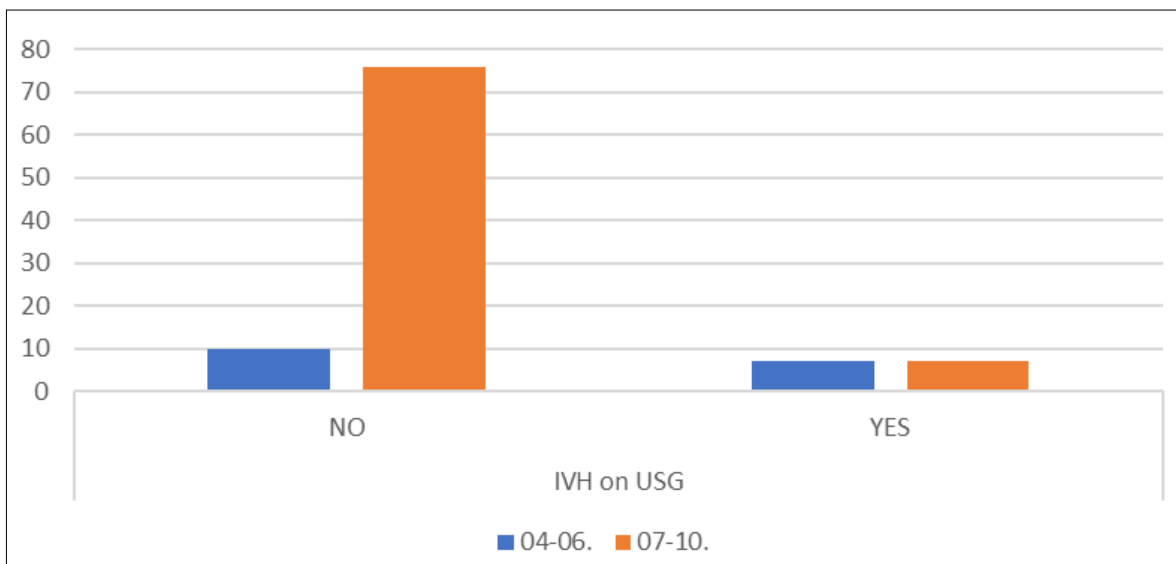


**Fig 3:** Association of APGAR at 1 min with IVH on USG

**Table 7:** Association of APGAR at 5 min with IVH on USG

APGAR at 5 min	IVH on USG		p-value
	No	Yes	
4-6	10 (11.6%)	7 (50%)	0.002
7-10	76 (88.4%)	7 (50%)	
Total	86 (100%)	14 (100%)	

Tab 17 shows Association of APGAR at 5 min with IVH on USG, among the neonates who did not show IVH on USG, 11.6% had Moderate APGAR score at 5 mins. In the neonates who had IVH on USG, 50% of the neonates showed APGAR Score at 5 mins with significant association having p value 0.002.

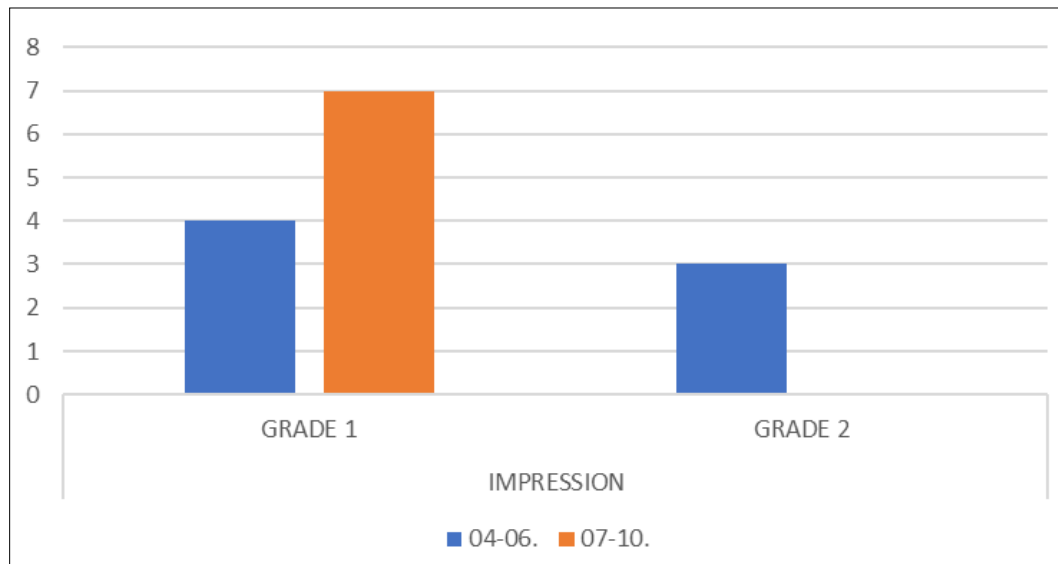


**Fig 4:** Association of APGAR at 5 min with IVH on USG

**Table 8:** Association of APGAR at 5 min with IVH on USG

APGAR at 5 min	IMPRESSION		p-value
	Grade 1	Grade 2	
4-6	4 (36.4%)	3 (100%)	0.096
7-10	7 (63.6%)	0 (0%)	
Total	11 (100.0%)	3 (100.0%)	

Fig shows Association of APGAR at 5 min with IVH on USG, out of 11 study subjects with grade I IVH, 7 subjects had APGAR score 7-10, and 4 subjects had APGAR score 4-6, whereas all 3 subjects with grade 2 IVH, all of them had APGAR 0-3, ON APPLYING CHI-SQUARE there is non-significant association with p value 0.096.



**Fig 5:** Association of APGAR at 5 min with IVH on USG

### Conclusions

On the basis of our present study the prevalence of IVH among preterm neonates in the present study was high (14%). Majority of them had grade I IVH. It was particularly high among those of gestational age  $\geq 30$  weeks. Caesarean section delivery is associated with lower likelihood of IVH. Apgar score less than 3 at five minutes was associated with occurrence and severe grades of IVH. Apnea has a significant association with presence of IVH neonates whose mothers were unbooked were at a higher risk of IVH than subjects with booked mothers.

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Not available

### Author's Contribution

Not available

### Conflict of Interest

Not available

### Financial Support

Not available

### References

- Hoyos A, Vasquez-Hoyos P. Neonatal Intra-Ventricular-Hemorrhage Prevention in Premature at < 30 Weeks Gestational Age. A 12 years experience. PREPRINTS [Internet]. 2022;7:13-21.
- Quinn J-A, Munoz FM, Gonik B, Frau L, Cutland C, Mallett-Moore T, *et al.* Preterm birth: Case definition & guidelines for data collection, analysis, and presentation of immunisation safety data. *Vaccine* [Internet]. 2016;34(49):6047-6056.
- Walani SR. Global burden of preterm birth. *Int J Gynaecol Obstet* [Internet]. 2020 Jul;150(1):31-33.
- Alliance for Maternal and Newborn Health Improvement (AMANHI) GA Study Group. Population-based rates, risk factors and consequences of preterm births in South-Asia and sub-Saharan Africa: A multi-country prospective cohort study. *J Glob Health* [Internet]. 2022;12:04011.
- Piro E. Germinal matrix hemorrhage-intraventricular hemorrhage: pathogenesis and outcomes. *Ital J Pediatr* [Internet]. 2015 Dec 24;41(S1):A31.
- Bolisetty S, Dhawan A, Abdel-Latif M, Bajuk B, Stack J, Lui K, *et al.* Intraventricular hemorrhage and neurodevelopmental outcomes in extreme preterm infants. *Pediatrics* [Internet]. 2014 Jan;133(1):55-62.
- Özek E, Kersin SG. Intraventricular hemorrhage in preterm babies. *Turk Pediatr Ars* [Internet]. 2020;55(3):215-21.
- Lekic T, Klebe D, Poblete R, Krafft PR, Rolland WB, Tang J, *et al.* Neonatal brain hemorrhage (NBH) of prematurity: translational mechanisms of the vascular-neural network. *Curr Med Chem* [Internet]. 2015;22(10):1214-1238.
- Bano S, Chaudhary V, Garga UC, Yadav S, Singh SK. Intracranial Hemorrhage in the Newborn. In: *Intracerebral Hemorrhage* [Internet]. InTech. 2014;3:1-7.
- Wilson D, Kim D, Breibart S. Intraventricular Hemorrhage and Posthemorrhagic Ventricular Dilation: Current Approaches to Improve Outcomes. *Neonatal Netw*. 2020;39(3):158-69.
- Fortmann I, Mertens L, Boeckel H, Grüttner B, Humberg A, Astiz M, *et al.* A Timely Administration of Antenatal Steroids Is Highly Protective Against Intraventricular Hemorrhage: An Observational Multicenter Cohort Study of Very Low Birth Weight Infants. *Front Pediatr* [Internet]. 2022;10:721355. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/35372176>
- Pai VB, Sakadjian A, Puthoff TD. Ibuprofen Lysine for the Prevention and Treatment of Patent Ductus Arteriosus. *Pharmacotherapy* [Internet]. 2008 Sep;28(9):1162-82.
- Ballabh P. Intraventricular hemorrhage in premature infants: mechanism of disease. *Pediatr Res* [Internet]. 2010 Jan;67(1):1-8.
- Ment LR, Oh W, Philip AGS, Ehrenkranz RA, Duncan CC, Allan W, *et al.* Risk factors for early intraventricular hemorrhage in low birth weight infants. *J Pediatr*. 1992;121(5):776-83.
- Rashid J, Shahid M, Anwar S, Sharaf D, Bhatti MT. Frequency of intraventricular haemorrhage in preterm

- neonates. Pakistan J Med Heal Sci. 2010;4(4):515-519.
16. Sajjadian N, Fakhrai H, Jahadi R. Incidence of intraventricular hemorrhage and post hemorrhagic hydrocephalus in preterm infants. Acta Med Iran [Internet]. 2010;48(4):260-262.
  17. Amato M, Howald H, von Muralt G. Incidence of periventricular hemorrhage in premature neonates weighing more than 1500 g. J Perinat Med [Internet]. 1987;15(1):91-94.
  18. Dani C, Poggi C, Bertini G, Pratesi S, Tommaso M Di, Scarselli G, *et al.* Method of delivery and intraventricular haemorrhage in extremely preterm infants. J Matern Neonatal Med. 2010;23(12):1419–23.

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