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Original Research

Neurosonographic Assessment of Intracranial Hemorrhage, Periventricular Leukomalacia and Ventriculomegaly in Preterm Neonates

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Abstract:

Introduction: Intracerebral hemorrhages, prenatal hypoxia, and congenital defects increase the risk of neurological problems in preterm infants. Appropriate care of these disorders depends on early detection. Cranial ultrasonography is a non-invasive method of diagnosing such diseases at the patient's bedside.

Aims: To investigate how neurosonograms can be used to identify several intracranial abnormalities in preterm newborns, including as ventriculomegaly, periventricular leukomalacia, intracranial hemorrhage, and other evolutionary changes.

Material and methods: The current study employed prospective research. From June 2025 to December 2025, this study was conducted in the Department of Radiodiagnosis at Shyamlal Chandrashekhar Medical College & Hospital, Khagaria, Bihar, India. Our study included 50 patients.

Result: Five patients (10.0%) had IVHG1, five patients (10.0%) had IVHG3, five patients (10.0%) had IVHG4, thirty patients (60.0%) had Normal Impression, and five patients (10.0%) had PVE in our study. Z has a value of 8. P has a value of less than.00001. At p <.05., the outcome is significant.

Conclusion: In this cohort investigation of high-risk preterm and term newborns, the most common lesions seen on CUS were congenital anomalies, cerebral edema, thalamic hyperechogenicity, PVL, and GMH-IVH. A number of unfavorable perinatal fetal and maternal factors were shown to be significantly correlated with abnormal CUS results.

Keywords: Preterm neonates, Cranial USG, Haemorrhages, CUS and PVL.

Introduction

Intracerebral hemorrhages, prenatal hypoxia, and congenital defects increase the risk of neurological problems in preterm infants. One of the main causes of neonatal mortality and morbidity, preterm neonates defined as babies born before 37 full weeks or 259 days of gestation have long-term negative health effects [1]. Compared to

children born at term, prematurely born children are more likely to experience respiratory ailments, learning impairments, sensory deficiencies, and cerebral palsy. Appropriate care of these disorders depends on early detection. Cranial ultrasonography is a non-invasive method of diagnosing such diseases at the patient's bedside. Cerebral palsy (CP) affected five percent of the surviving newborns born before 32 weeks of pregnancy [2].

Of these newborns, 92% had US anomalies, of which 83% were significant and 17% were minor. However, in a group of newborns born between 32 and 36 weeks of gestation, just 6% of survivors experienced CP.96% of these newborns (32–36 weeks) had US abnormalities, with severe abnormalities in 89% and moderate abnormalities in 11%. A sensitivity of 76% to 86% and a specificity of 95% to 99% were observed when taking into account the main anomalies in the US. The main purposes of imaging patients are to assess the extent of the injury, predict prognosis, and guide treatment during the acute phase [3].

Anterior fontanelle neurosonograms are the best acoustic windows and are just as helpful as CT scans. Ultrasonography is a great non-invasive, affordable, quick, and secure imaging method for assessing the pathologic states of an infant's brain [4]. In asphyxiated infants, cranial sonography is also sensitive enough to detect hydrocephalus, periventricular leukomalacia, and hemorrhage. In addition, there is no radiation exposure and no need for any drugs, such as sedatives or intravenous contrast agents [5].

Materials and methods

Type of study

Prospective study

Source of data:

Data for the study was collected from patients attending the department of Radio-diagnosis, Shyamlal Chandrashekhar Medical College & Hospital, Khagaria, Bihar, India.

Method of collection of data

The Department of Radiodiagnosis at Katihar Medical College and Hospital conducted this prospective investigation. 50 preterm neonates who were referred to the Department of Radiodiagnosis for cranial ultrasonography throughout the course of 18 months, from June 2025 to December 2025, are included in this study.

Inclusion criteria

Preterm neonates (Less than 37 weeks of gestation).

Exclusion criteria

a. Babies with gross congenital malformations.
b. Post-term Babies.

Statistical Analysis:

Microsoft Excel was used to enter the data, and GraphPad Prism version 5 and SPSS version 27.0 were used for analysis. The mean ± standard deviation was used to summarize numerical variables, whereas frequencies and percentages were used to summarize categorical variables. When necessary, independent and paired t-tests were used to evaluate mean differences. The proportions were compared using the Z-test. Student's t-distribution was used to establish statistical significance, and a p-value of less than 0.05 was deemed statistically significant.

Result

Table 1: Distribution of Sex

Sex	Frequency	Percent
Female	29	58.0%
Mae	21	42.0%
Total	50	100.0%

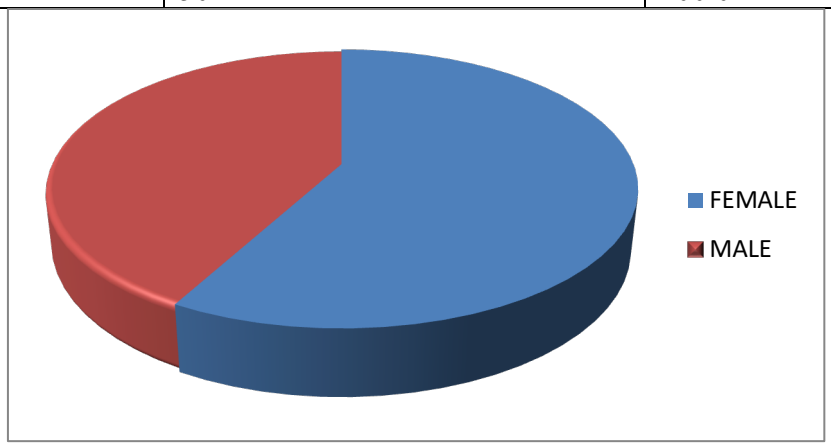

Figure 1: Distribution of Sex

Table 2: Distribution of Obstetric History

Obstetric History	Frequency	Percent
G1P1L1A0	5	10.0%
G2P1L1A0	4	8.0%
G3P1L1A0	5	10.0%
G3P1L1A1	15	30.0%
G3P2L2A0	10	20.0%
PRIMI	11	22.0%
Total	50	100.0%

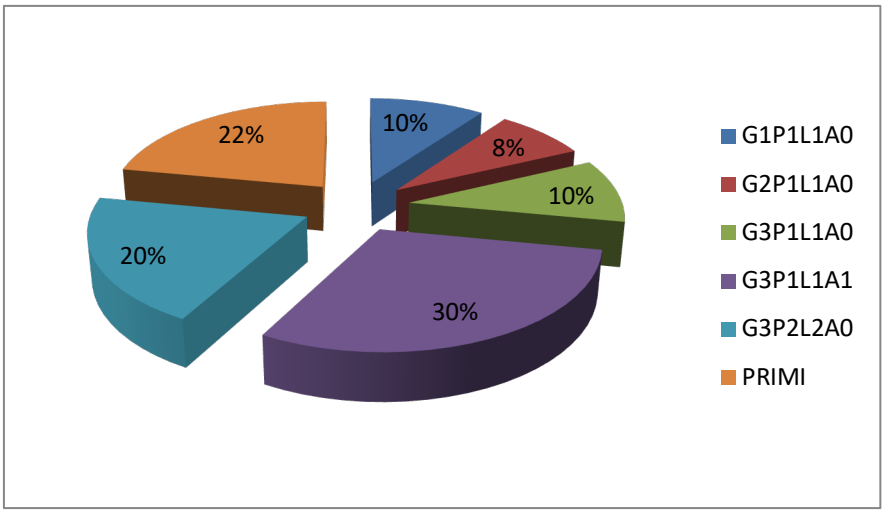

Figure 2: Distribution of Obstetric History

Table 3: Distribution of Falx Cerebri

Falx Cerbri	Frequency	Percent
SC	50	100.0%
Total	50	100.0%

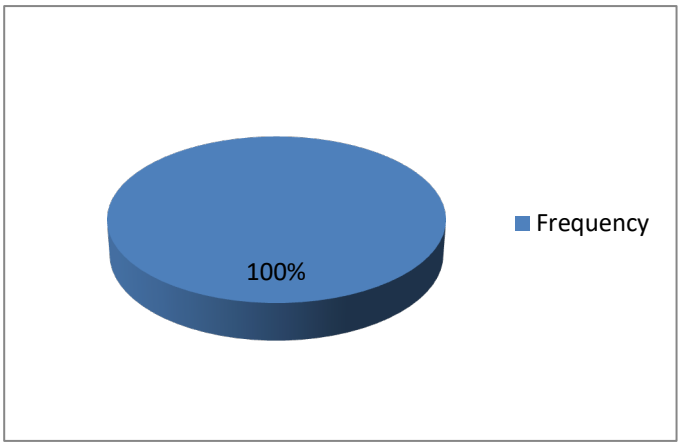

Figure 3: Distribution of Falx Cerebri

Table 4: Distribution of Cerebral Echotexture

Cerebral Echotexture	Frequency	Percent
Normal	50	100.0%
Total	50	100.0%

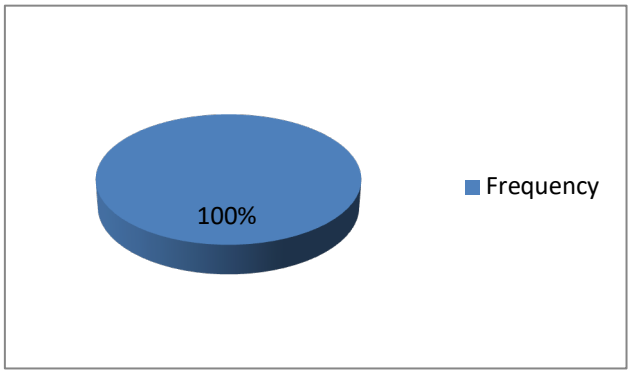

Figure 4: Distribution of Cerebral Echotexture

Table 5: Distribution of Sulci/Fissuure

Sulci/Fissuure	Frequency	Percent
Normal	50	100.0%
Total	50	100.0%

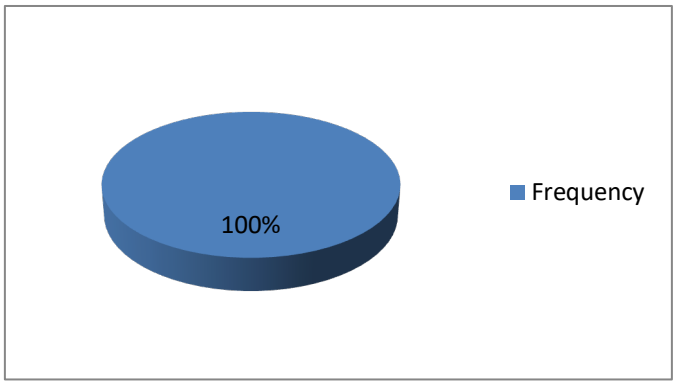

Figure 5: Distribution of Sulci/Fissuure

Table 6: Distribution of Focal Parenchymal Echogenic Lesion (FPE)

Focal Parenchymal Echodence Lesion (FPE)	Frequency	Percent
AB	50	100.0%
Total	50	100.0%

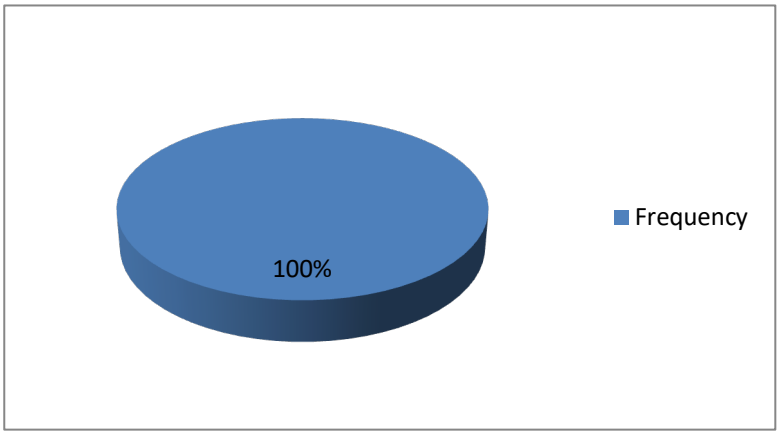

Figure 6: Distribution of Focal Parenchymal Echogenic Lesion (FPE)

Table 7: Distribution of Periventricular Echogenicity

Periventricular Echogenicity	Frequency	Percent
Absent	34	68.0%
Present	16	32.0%
Total	50	100.0%

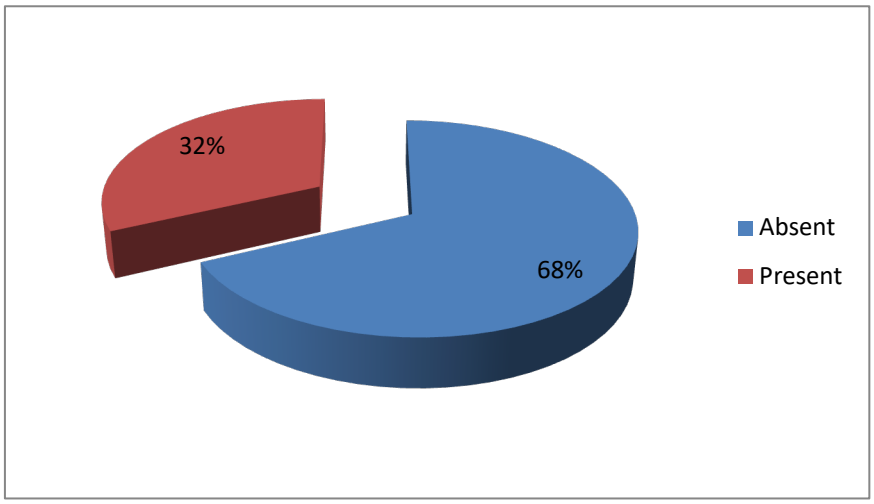

Figure 7: Distribution of Periventricular Echogenicity

Table 8: Distribution of Size of the Ventricles

Size of the Ventricles	Frequency	Percent
VM	4	08%
Normal	46	92.0%
Total	50	100.0%

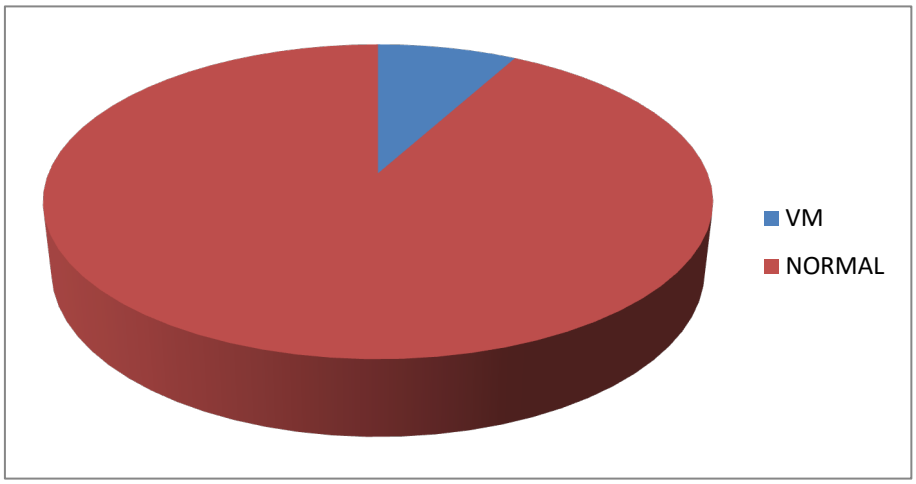

Figure 8: Distribution of Size of the Ventricles

Table 9: Distribution of Subependymal/Intraventicular Hemorrhage

Subependymal/Intraventicular Hemorrhage	Frequency	Percent
Absent	35	70.0%
Grade 1	6	12.0%
Grade 2	5	10.0%
Grade 3	4	08.0%
Total	50	100.0%

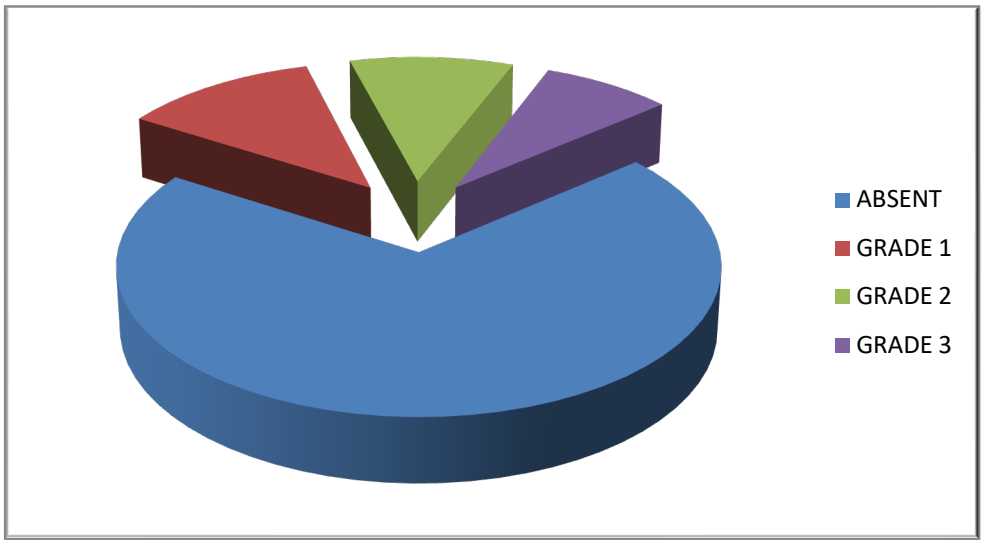

Figure 9: Distribution of Subependymal/Intraventicular Hemorrhage

Table 10: Distribution of Choroid Plexus

Choroid Plexus	Frequency	Percent
Normal	50	100.0%
Total	50	100.0%

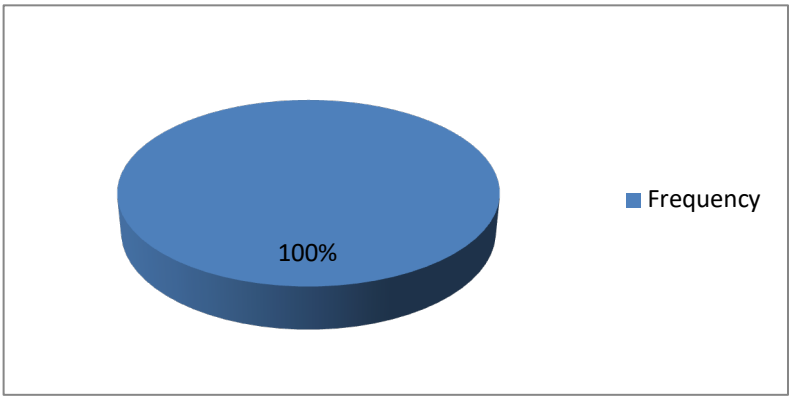

Figure 10: Distribution of Choroid Plexus

Table 11: Distribution of Porencephalic Cystic Changes

Porencephalic Cystic Changes	Frequency	Percent
Absent	50	100.0%
Total	50	100.0%

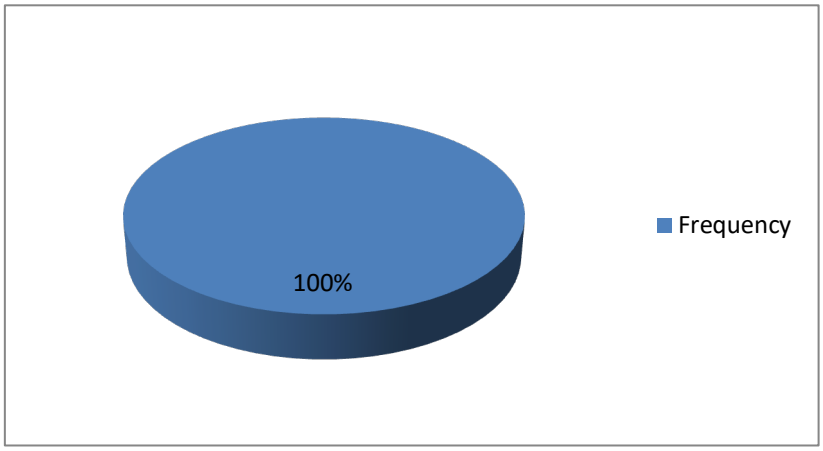

Figure 11: Distribution of Porencephalic Cystic Changes

Table 12: Distribution of Midline Shifts

Midline Shifts	Frequency	Percent
No	50	100.0%
Total	50	100.0%

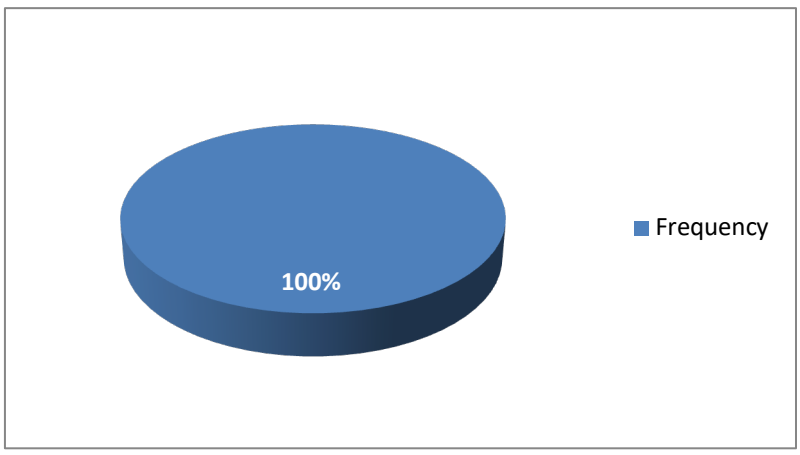

Figure 12: Distribution of Midline Shifts

Table 13: Distribution of Cerebellum

Cerebellum	Frequency	Percent
Normal	50	100.0%
Total	50	100.0%

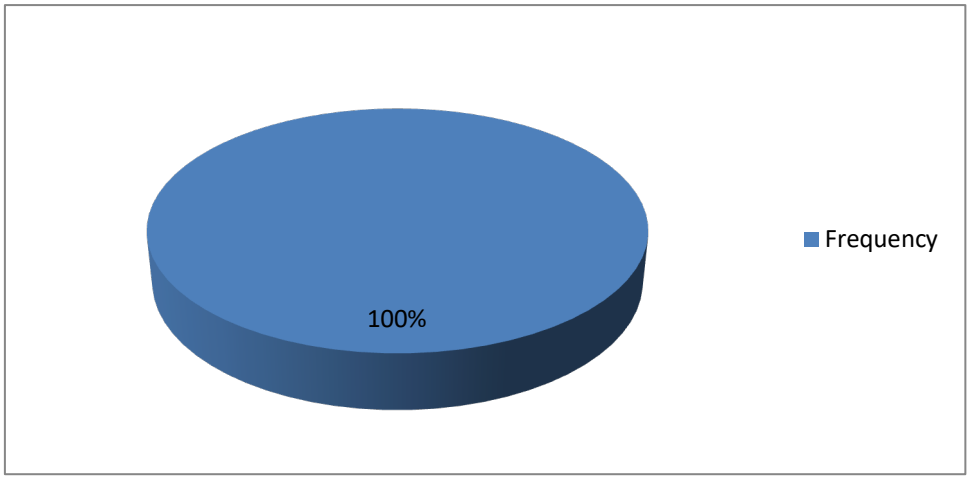

Figure 13: Distribution of Cerebellum

Table 14: Distribution of Follow up Scan

Follow up Scan	Frequency	Percent
RS	45	90.0%
VM	5	10.0%
Total	50	100.0%

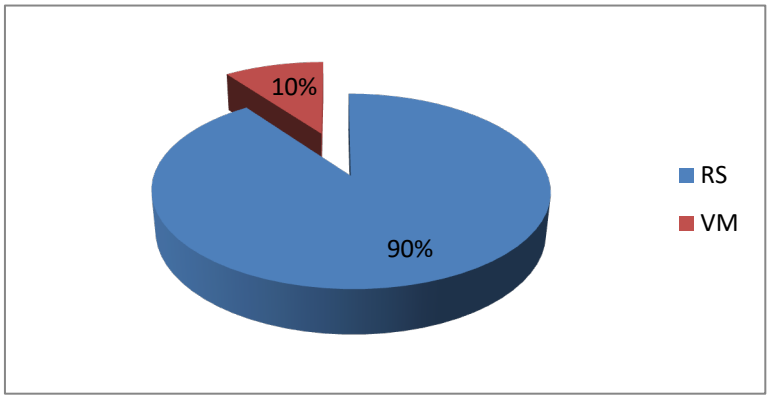

Figure 14: Distribution of Follow up Scan

Table 15: Distribution of Impression

Impression	Frequency	Percent
IVHG1	6	12.0%
IVHG2	5	10.0%
IVHG3	4	08.0%
Normal	30	60.0%
PVE	5	10.0%
Total	50	100.0%

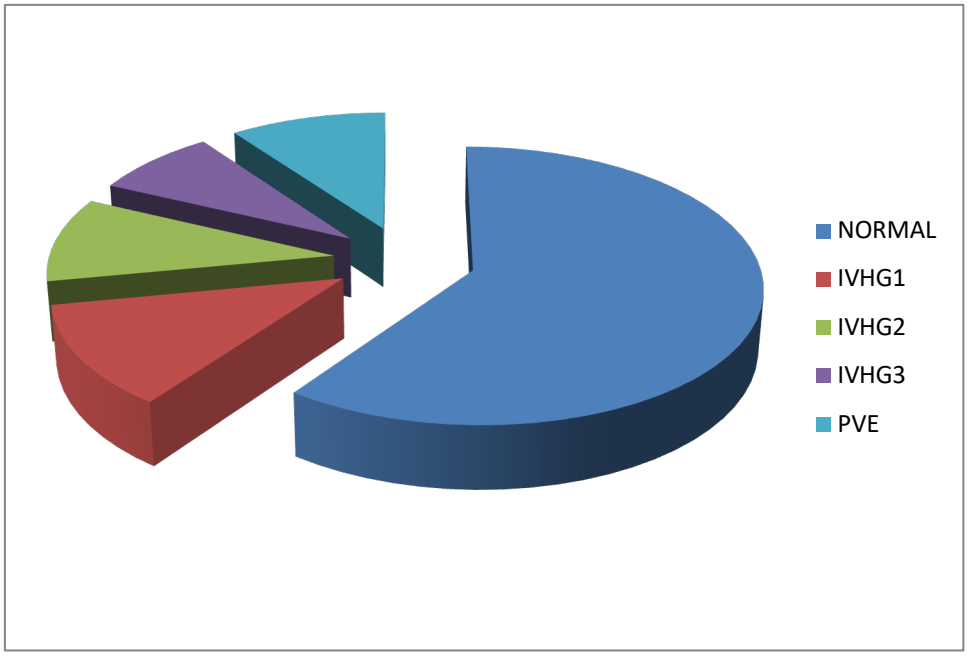

Figure 15: Distribution of Impression

Table 16: Distribution of mean B Wt (in KG)

	Number	Mean	SD	Minimum	Maximum	Median
B Wt (in KG)	50	2.0980	.3229	1.3000	2.5000	2.1000

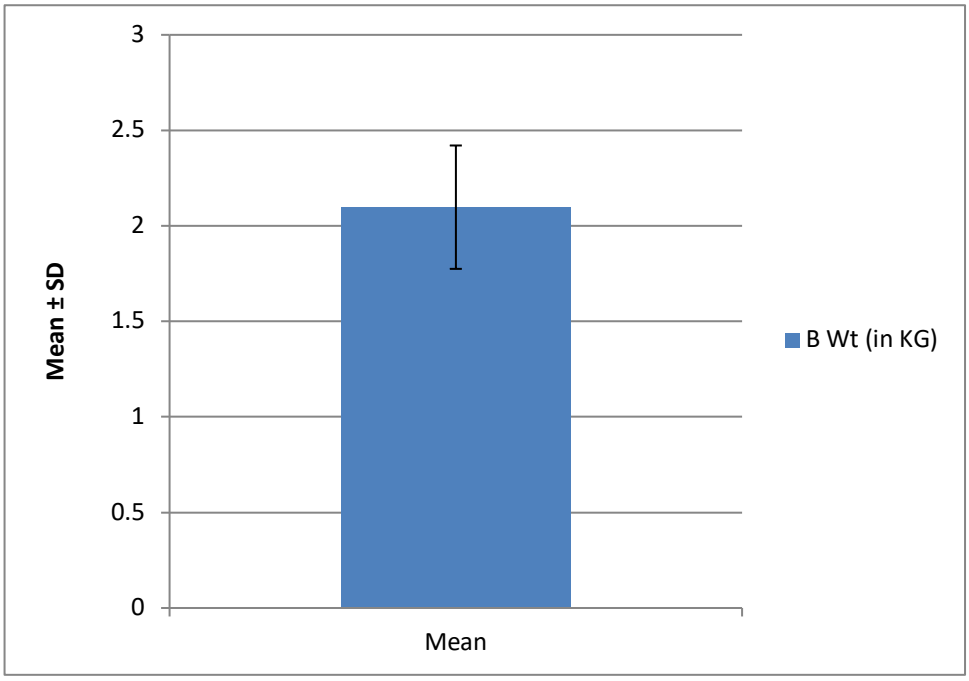

Figure 16: Distribution of mean B Wt (in KG)

Table 17: Distribution of mean Weeks of Gestation

	Num-ber	Mean	SD	Mini-mum	Maxi-mum	Median
Weeks of Gestation	50	32.7200	2.3908	28.0000	35.0000	33.5000

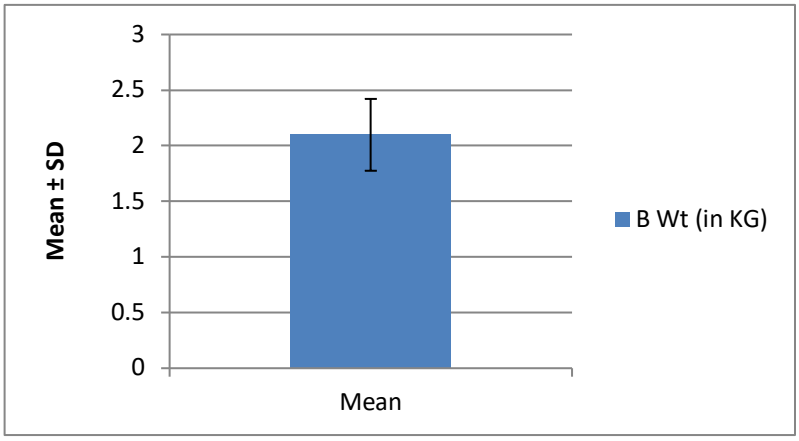

Figure 17: Distribution of mean Weeks of Gestation

Discussion

The current prospective study, which included 50 preterm neonates, was carried out in the Department of Radiodiagnosis at Shyamlal Chandrashekhar Medical College & Hospital, Khagaria, Bihar, India, between June 2025 to December 2025. There was equal representation of male and female infants (50 percent each). The majority of moms had a statistically significant gravida status of G3P1L1A1 (30%). All instances had normal falx cerebri, cerebral echotexture, sulci, and no focal parenchymal echodense lesions, according to neurosonographic examination. 32% of patients had periventricular echogenicity, which was statistically significant. Seventy percent of infants had no signs of intraventricular or subependymal bleeding, and the majority had normal ventricular size [6].

The cerebellum, choroid plexus, and lack of midline shift or porencephalic cysts were all normal in all individuals. In 60% of patients, a normal neurosonographic impression was found. The average gestational age at admission was 32.72 ± 2.39 weeks, and the average birth weight was 2.09±.32 kg.

These results are in line with earlier research. Cranial sonography is a secure and reliable way to identify hydrocephalus and germinal matrix haemorrhage [2]. Another study also documented a number of cerebral abnormalities in preterm infants, including intracranial bleeding and hydrocephalus [7]. The significance of routine cranial ultrasonography in the early detection of brain abnormalities and assessment of neurodevelopmental risk in preterm infants was highlighted by different study [8].

All things considered, neurosonography has shown itself to be a dependable, secure, and efficient technique for the early identification of intracranial anomalies in premature infants [5].

Conclusion

The significance of cranial ultrasonography (CUS) in assessing intracranial anomalies in preterm newborns is highlighted by this study. While subependymal and intraventricular hemorrhages were rare, the majority of patients displayed normal neurosonographic findings, with a small number of moderate ventriculomegaly and periventricular echogenicity instances. The group was primarily preterm, as indicated by the mean birth weight and gestational age. Prematurity, low birth weight, and perinatal problems were risk factors linked to abnormal CUS findings. A safe, dependable, and efficient bedside imaging technique for identifying brain damage early on and directing treatment and prognosis in high-risk newborns is cranial ultrasonography.

References

1. Kumar S, Kurup S, Pournami F, Prithvi AK, Kolisambeevi AA. Neurosonograms in very preterm neonates : Findings , risk factors , and association with neurodevelopmental outcome : A retrospective study. J Curr Res Sci Med |. 2024;97–101.
2. Kavya MK, Radhamani K V, Mahesh P. Cranial ultrasound in detection of neurological lesions in preterm neonates in a tertiary center in North Kerala , India. nternational J Contemp Pediatr. 2017;4(3):804–9.
3. Bhat V, Bhat V. Neonatal neurosonography : A pictorial essay. Indian J Radiol Imaging. 2014;24(4):389–400.
4. Kumar N, Mk S, Ak G, Jpk G, Sk S, Vk G, et al. Role of cranial ultrasound for diagnosis of intracranial abnormalities in newborns. Int J Pediatr Res. 2016;3(4):240–5.
5. Radovanovic M, Obradovic S, Medovic R, Markovic S. Evolution of Neurosonographic Findings After Periventricular / Intraventricular Hemorrhage. Iran J Pediatr. 2022;32(6):e114437.
6. M. R. VAN GELDER-HASKER, G. VAN WEZEL-MEIJLER, L. DE GROOT HPVG and JIPDV. Peri- and intraventricular cerebral sonography in second- and third-trimester high-risk fetuses: a comparison with neonatal ultrasound and relation to neurological development. Ultrasound Obs Gynecol 2003; 2003;22(July):110–20.
7. Adeshina O, Menon TP, Ambekar A, Tanchanco C, Darden J. Early Human Development Exploring the neurological impact of prematurity : Shared mechanisms in periventricular leukomalacia (PVL), intraventricular hemorrhage (IVH), and hydrocephalus. Early Hum Dev [Internet]. 2026;212(September):106435. Available from: https://doi.org/10.1016/j.earlhumdev.2025.106435
8. Humsene K, Krishnaveni N, Sarada B. Transcranial Perinatal Neurosonogram for Intracranial Pathology : Study of 165 Cases. J Med Sci Heal. 2016;2(2):29–36.