Original Article

Incidence & Risk Factors Of Intraventricular Hemorrhage (Ivh) In Preterm Infants At Level Three Neonatal Intensive Care Unit

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Abstract

Background and Aim: Neonatal prematurity and underweight are the two main causes of IVH, a serious multifactorial condition in preterm babies. Our study aims to define the incidence and the risk factors of intraventricular Hemorrhage in Preterm Infants in the Neonatal Intensive Care Unit.

Materials and Methods: This retrospective cross-sectional study was conducted on 1415 premature neonates (with a gestational age of ≤32 weeks admitted to NICU at Saudi Arabia for a ten year record. The study population was selected using the census method, and patients who were discharged or died before the seventh day of birth were excluded from the study. The demographic information, which included gestational age, birth weight, and method of delivery, was taken from the neonates' medical records. Use of mechanical breathing, 1- and 5-minute Apgar scores, head circumference, pneumothorax, thrombocytopenia, resuscitation, corticosteroid prescription for the mother before delivery, and neonatal and maternal profiles are all factors to consider. The infants were divided into two case and control groups, one for infants with IVH and the other for infants without IVH. Spss was used for analysis.

Results: as per study 29 (2%) children had IVH and 98% had no IVH out of 1415 participants. Among IVH grade II was most common followed by Grade IV. According to the results of this study, 61.2% of the neonates were male, and their mean gestational age was 30.39±1.71 weeks (range: 24-32 weeks). Furthermore, the participants' mean birth weight was 1542.33±354.55 g (range: 659-2600 g). As it can be observed, IVH revealed a significant relationship between the mean gestational age and neonatal weight(P=0.01&P=0.04, respectively). The comparison of head circumference and 1-minute Apgar scores between the case and control groups indicated no significant difference (P=0.21&P=0.23, respectively). Main risk factors are differed significantly regarding the need for mechanical ventilation (P=0.03). Moreover, the comparison of Pneumothorax between the newborns with and without IVH indicated a significant difference (P=0.01).

Conclusion: The incidence of IVH in present study was 2%. Hence, the According to the results of the current study, IVH was quite common among newborns admitted to NICU based on other studies

Key words: Intra-ventricular hemorrhage, premature neonate, low birthweight, Pneumothorax, Thrombocytopenia,

Introduction:

With the advances in neonatal perinatal services over the last two decades, the survival of preterm infants has improved significantly. This improvement is a reflection of the advances in antenatal, perinatal and neonatal care including increasing use of antenatal steroids, surfactant therapy, and improved respiratory and nutritional management.[1,2,3]

In the face of this improvement, the high morbidities of these preterm infants remain a major concern as they are associated with higher incidence of adverse neurodevelopmental outcome. One of the major morbidities that cause significant immediate mortality, cerebral palsy and mental retardation is intraventricular hemorrhage (IVH).[3]

The incidence varied from one unit to other ranging from 12 -40%. A number of maternal, fetal, perinatal and postnatal risk factors been proposed as associated with the development of IVH: extreme low birth weight, gestational age, breech presentation, gender, premature rupture of membranes, mode of delivery, prolonged labor, postnatal resuscitation and intubation, transferal from one unit to another, early onset of sepsis, development of respiratory distress syndrome or pneumothorax, recurrent endotracheal suctioning, metabolic acidosis and rapid bicarbonate infusion,[4,5] In the kingdom of Saudi Arabia, like many other developing country the neonatal services and setup varied from one city to another.

Materials and Methods:

This retrospective cross-sectional study was conducted on 1415 premature neonates (with a gestational age of ≤32 weeks admitted to NICU at Saudi Arabia for a ten year record. The study population was selected using the census method, and patients who were discharged or died before the seventh day of birth were excluded from the study.

Methodology-

The demographic information, which included gestational age, birth weight, and method of delivery, was taken from the neonates' medical records. Use of mechanical breathing, 1- and 5-minute Apgar scores, head circumference, pneumothorax, thrombocytopenia, resuscitation, corticosteroid prescription for the mother before delivery, and neonatal and maternal profiles are all factors to consider. The infants were divided into two case and control groups, one for infants with IVH and the other for infants without IVH.

On the seventh day after birth, a cranial ultrasound was done due to the onset of intraventricular hemorrhage symptoms such low blood pressure, apnea, jaundice, cyanosis, and weakness. Suck reflex, unusual ocular symptoms, high-pitched sounds, scream-like weeping, seizure or weakened muscle tone, metabolic acidosis, shock, and low hematocrit are some signs to look out for. All ultrasounds were done using the GE Volson E6 by a radiologist. Using Papile classification, the IVH diagnosis was made based on ultrasound studies. According to this classification, the severity of this condition was divided into four grades: Grade 1 (light bleeding in the sub-ependymal germinal matrix), Grade 2 (extensive bleeding in 50% of the ventricular and intracerebral hemorrhage without ventricular dilatation), Grade 3 (extensive bleeding in >50% of the ventricular and intraventricular hemorrhage with and Grade 4(periventricular venous infarction involving the obstruction of blood flow through the periventricular terminal vein).

Statistical Analysis-

The statistical analysis was performed using SPSS for windows version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi-squared test. Chi-squared test was used to find the association among variables. The critical value of P indicating the probability of significant difference was taken as <0.05 for comparison. The present research was approved by the Ethics Committee and the confidentiality and anonymity of the participants' data were observed.

Results –

Table 1- Classification of Participants on the basis of IVH

Classification		**N(%)**
IVH	Grade I	3
	Grade II	12
Grade III		4
Grade IV		10

No IVH	1386

AS per table 1 based on brain ultrasound participants were divided on the basis of IVH and No IVH as per study 29 (2%) children had IVH and 98% had no IVH out of 1415 participants. Among IVH grade II was most common followed by Grade IV.

Table 2- Demographic details of participants based on IVH

Variables	With intraventricular hemorrhage		Without intraventricular hemorrhage		P-value
	Mean	SD	Mean	SD	
Gestational age	29.5	2.35	30.64	1.41	0.01*
Weight	1423.42	422.14	1574.6	328.2	0.04*
Head circumference	28.68	3.76	29.51	2.11	0.21
1-minute Apgar scores	5.36	1.86	5.72	1.83	0.23
5-minute Apgar scores	7.23	1.8	7.87	1.31	0.04*

As per table 2 According to the results of this study, 61.2% of the neonates were male, and their mean gestational age was 30.39±1.71 weeks (range: 24-32 weeks). Furthermore, the participants' mean birth weight was 1542.33±354.55 g (range: 659-2600 g). As it can be observed, IVH revealed a significant relationship between the mean gestational age and neonatal weight(P=0.01&P=0.04, respectively). The comparison of head circumference and 1-minute Apgar scores between the case and control groups indicated no significant difference (P=0.21&P=0.23, respectively).However, there was a significant difference between the two groups in terms of the 5-minuteApgar scores (P=0.04). The mean 1- and 5-minute Apgar scores were 5.36±1.86 (range: 1-9) and 7.87±1.31(range: 2-10). The mean head circumference was 29.33±2 cm (range:26-34).

Table 3- The frequency of risk factors based on intraventricular hemorrhage

Variables		With intraventricular hemorrhage		Without intraventricular hemorrhage		P-value
		Percent	No	Percent		
Gender	Male	16	68.4	818	59.3	**0.35**
	Female	13	31.6	568	40.7	
Type of delivery	Natural	12	28.9	263	19.3	**0.17**
	Cesarean section	17	71.1	1123	80.7	
Resuscitation	Yes	20	52.6	720	52.9	**0.98**
	No	9	74.4	666	47.1	
Mechanical ventilation	Yes	23	86.8	956	69.3	**0.03***
	No	6	13.2	430	30.7	

Pneumothorax	Yes	5	10.5	20	2	**0.01***
	No	24	89.4	1366	98	
Thrombocytopenia	Yes	9	10.5	6	4.3	**0.13**
	No	20	89.4	1380	95.7	
DIC	Yes	21	84.2	20	2	**0.87**
	No	8	15.8	1366	98	
AKI	Yes	8	15.8	70	5	**0.21**
	No	21	84.2	1316	95	
Sepsis	Yes	21	15.8	123	0	**0.45**
	No	**8**	**84.2**	**1263**	**91**	

As per table 3 about 28.4% and 80.6% of the infants were born via vaginal delivery and cesarean section, respectively. Moreover, 52.8% of the newborns were exposed to neonatal resuscitation at birth, while 47.2% of the participants needed no resuscitation. Almost 73% of the neonates received mechanical ventilation, and the rest had spontaneous breathing. Pneumothorax was observed in only 2.5% of the newborns, and thrombocytopenia was noticed in 7.6% of the neonates. Likewise, no significant difference was observed between the two study groups in terms of thrombocytopenia (P=0.13). The case and control groups differed significantly regarding the need for mechanical ventilation (P=0.03). Moreover, the comparison of Pneumothorax between the newborns with and without IVH indicated a significant difference (P=0.01). DIC, Sepsis and Thromobocytopenia were not significant.

Discussion-

Our research revealed that compared to other babies, premature infants with IVH had lower mean gestational ages, weights, and 5-minute Apgar scores. Moreover, all infants with IVH suffered from pneumothorax, and 85% of them required mechanical breathing. Around one-fifth of all premature newborns in the current study developed IVH, and this finding is consistent with the rate reported in a related study in Iran[6]. In a research by Philip et al., IVH was seen in over 20% of the preterm infants born at 34 weeks gestation.[7]
According to estimates, 36% of babies with gestational ages between 22 and 28 weeks had IVH.[8] Moreover, Dyet et al research found that More than 40% of infants delivered between the 23rd and 30th weeks of pregnancy had brain hemorrhage, and ventricular dilatation was noted in 50% of these newborns following IVH.[9] Another study found that 45% of preterm infants had GMH/IVH.[3]

Additionally, the IVH grade and patient prognosis were directly correlated. About this, Brouwer et al. showed that premature babies with grade III (VH) had a better prognosis than those with grade IV IVH .[10] According to Bolisetty et al., neonates with higher degrees of IVH had higher rates of developmental delay, cerebral palsy, deafness, and blindness.[11] Also, the likelihood of survival was higher in newborns with IVH who had higher hemorrhage grades than it was in newborns who had lower hemorrhage grades.[12]

Mulindwa et al. reported that the mean weight and gestational age were in agreement with our findings compared to individuals without these issues were lower in newborns with IVH. Their findings regarding the prevalence of IVH and its severity among babies were consistent with those of our study.[13] Moreover, Moghaddam et al. showed that less than 10% of LBW neonates had IVH, indicating that LBW neonates typically had LBW.[14]

A high risk of IVH exists in newborns weighing less than 1000 g (14% and 24%, respectively, for 750-1000 and 750 g.
Rarely, IVH is identified as soon as the baby is born. Only 50% of neonates receive a diagnosis on the first day following birth in this regard. As a result, less than 5% of babies are diagnosed after four or five days after delivery, while 75% and 90% of neonates are diagnosed in the first three days and first week of their birth, respectivel.[15,16] It is uncommon for IVH to occur within the first month of life; nonetheless, some IVH patients exhibit no outward signs of the condition.

Conclusion-

Neonatal prematurity and underweight are the two main causes of IVH, a serious multifactorial condition in preterm babies. The incidence of IVH in present study was 2%. Hence, the According to the results of the current study, IVH was quite common among newborns admitted to NICU based on other studies. However, various characteristics, including as low LBW, a 5-minute Apgar score, gestational age, and the requirement for artificial ventilation, increase the incidence of this illness in premature neonates considered as risk factors.

Conflict of Interest- None declared

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