

Risk Factors of Intracranial Hemorrhage in Premature Neonates

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Abstract- Intraventricular hemorrhage (IVH) is an important cause of brain injury in premature neonates. Current study tries to define associated risk factors of IVH in preterm neonates in Aliasghar Children Hospital during 2008 to 2011. In this study, the risk factors have been evaluated in premature neonates with IVH, who had at least one brain sonography since their admission in NICU. A total of 63 premature neonates with IVH were assessed. Mean gestational age was 29.81 (24-34) weeks and mean birth weight was 1290.83±382.96 gr. Other risk factors such as sex, mode of delivery, history of using infertility drugs, maternal disease, maternal hypertension and preeclampsia, lumbar puncture, ventilator therapy and pneumothorax were considered. Because no absolute treatment for IVH is available, identifying risk factors is important in prevention and management of IVH.

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Introduction

Germinal matrix-intraventricular hemorrhage (GM-IVH) is common and distinctive intracranial hemorrhage in premature neonates. IVH is characterized by bleeding of the immature subependymal germinal matrix in preterm newborns in four different degrees (1-4), but the etiology is sophisticated and multi factorial. In recent decades, the incidence of IVH is decreased (50 to 20%) because of improved prenatal care and antenatal corticosteroid administration, but it is still a major cause of morbidity in premature neonates (1).

Numerous risk factors are associated with IVH occurrence statistically, including chorioamnionitis, PROM, maternal diabetes mellitus, fever, caesarean section (C/S), mechanical ventilation, however preeclampsia and using corticosteroids before birth decrease incidence of IVH (2). Neonates with IVH are at great risk for cerebral parenchymal injury, death and subsequent neurodevelopmental disability even survive (3). Furthermore, treatment of a neonate with IVH constrains a great budget on health services.

In this investigation, the authors have assessed associated risk factors of IVH in premature neonates to explore possible strategies for prevention.

Materials and Methods

This was a prospective, cross-sectional study performed on preterm newborns (<37 weeks) with IVH in one of the referral pediatric hospitals of the Tehran University of Medical Sciences (Aliasghar Hospital), 2008- 2011. The beginning step of evaluation was filling up a questionnaire by expert staffs. All important maternal and fetal criteria were considered. Maternal history included: history of maternal diabetes, infections, preeclampsia, hypertension, infertility drugs, and neonatal data included: sex, gestational age, birth weight, mode of delivery, platelet count, lumbar puncture, mother corticosteroid administration before birth, mechanical ventilation, pneumothorax.

Patients were diagnosed by head ultrasonography. First ultrasonography (through anterior fontanelle) was performed in the third day for all preterm - low birth weight neonates by an expert radiologist. Follow up ultrasounds were performed weekly or when it was needed.

Results

In 63 premature newborns with IVH, born in Aliasghar Hospital in 2008-2011, mean gestational age

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was 29.81 ± 2.30 weeks and mean birth weight was 1290.83 ± 382.96 . We also found low mean platelet count [Mean \pm SE (Min-Max) 167000 ± 11480 (30000-

780000)] among participants. The frequencies of other risk factors are shown in table 1.

Table1. The frequency of risk factors of IVH in premature neonates

Risk factor	Number (%)	Number (%)
Sex (male-female)	37 (59)	25 (31)
Mode of delivery (C/S-NVD)	39 (81)	8 (19)
History of infertility drugs (Yes-No)	23 (21)	42 (67)
Preeclampsia, HTN history (Yes-No)	20 (32)	43 (68)
Maternal infection (Yes- No)	8 (17)	40 (83)
Lumbar puncture (Yes-No)	46 (73)	17 (23)
Maternal Diabetes history (Yes-No)	5 (8)	58 (92)
Ventilator therapy (Yes-No)	32 (62)	24 (38)
pneumothorax (Yes-No)	21 (33)	42 (67)

Discussion

Although improved, sophisticated prenatal care and neonatal NICU have led to lower mortality rate in low birth and preterm neonates, but the neurodevelopmental fate stays uncertain (3). There is a fact that low birth weight and gestational age are main risk factors for IVH occurrence (4).

Shankaran *et al.*, showed that the most important factor among pre and perinatal factors is birth weight. Vural *et al.*, in Turkey also pointed to incidences of IVH between 500 to 2000 gr neonates, 37% to 5% respectively (5). IVH occurs more frequently before 35 weeks gestation. Larroque in his investigation confirmed white matter damage and periventricular leukomalacia in neonates with 22-32 weeks gestational age are much noteworthy (6).

So In the current study the authors evaluated the risk factors of IVH among premature neonates.

Homeostatic disorders in high risk newborns with IVH can initiate or exacerbate the bleeding. Some current studies like ours confirmed that patients with IVH had lower mean platelet count (7).

The frequency of IVH in male newborns in this study is compatible with other studies. Mortality and morbidity are higher in male fetal and neonatal life. Prematurity, very low birth weight, respiratory distress syndrome, and hyperbilirubinemia are more common in boys, too. Contributing factors could be hormonal, physiological, genetic and molecular alteration factors. Biological sex can influence pathogenesis of brain injuries. White Matter in males was vulnerable to adverse effects of prematurity (8).

Wallin *et al.*, revealed that ventilator therapy is one of the main predictive factors of IVH. It seems that rise in PaCO₂, as well as circulating vasopressors, and venous pressure in babies under ventilator are

responsible for IVH (9). IVH was more frequent in participants of the present study that were under ventilator, too.

Among participants of this study, the rate of C/S was higher than NVD (natural vaginal delivery). However, in several studies mode of delivery was not associated with the IVH (3,4) and in others C/S delivery reduced the risk of IVH (1).

Although the authors did not report a high prevalence of pneumothorax in neonates with IVH, but other investigations denote pneumothorax as a risk factor (9).

In addition, present results are compatible with Ertan *et al.*, study that considered maternal diseases are not associated risk factors of neonatal IVH (4).

As a matter of fact, intraventricular hemorrhage is a prevalent disease in premature neonates. Complications of prematurity could be reduced by better risk management of newborns with IVH. No absolute treatment for IVH is available. So conducting prevalence studies regarding associated risk factors of IVH would be important in prevention and management of neonatal IVH.

References

1. Martin JB. Prevention of Intraventricular Hemorrhages and Periventricular Leukomalacia in the ExtremelyLow Birth Weight Infant. *Newborn Infant Nurs Rev* 2011;11(3):141-52.
2. Larroque B, Marret S, Ancel PY, et al. White matter damage and intraventricular hemorrhage in very preterm infants: the EPIPAGE study. *J Pediatr* 2003;143(4):477-83.
3. Ment LR, Oh W, Philip AG, et al. Risk factors for early intraventricular hemorrhage in low birth weight infants. *J Pediatr* 1992;121(5 Pt 1):776-83.
4. Ertan AK, Tanriverdi HA, Meier M, et al. Perinatal risk

- factors for neonatal intracerebral hemorrhage in preterm infants. *Eur J Obstet Gynecol Reprod Biol* 2006;127(1):29-34.
5. Vural M, Yilmaz I, Ilikkan B, et al. Intraventricular hemorrhage in preterm newborns: risk factors and results from a University Hospital in Istanbul, 8 years after. *Pediatr Int* 2007;49(3):341-4.
 6. Mao C, Guo J, Chituwo BM. Intraventricular haemorrhage and its prognosis, prevention and treatment in term infants. *J Trop Pediatr* 1999;45(4):237-40.
 7. Setzer ES, Webb IB, Wassenaar JD, et al. Platelet dysfunction and coagulopathy in intraventricular hemorrhage in the premature infant. *J Pediatr* 1982;100(4):599-605.
 8. Cuestas E, Bas J, Pautasso J. Sex differences in Intraventricular Hemorrhage rates among Very Low Birth Weight newborns. *Gend Med*.2009;6(2):376-82.
 9. Wallin LA, Rosenfeld CR, Lupton AR, et al. Neonatal intracranial hemorrhage: II. Risk factor analysis in an inborn population. *Early Hum Dev* 1990;23(2):129-37.