

## Evaluation of Incidence of Intraventricular Hemorrhage after Blood Transfusion in Preterm Neonates

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**Abstract:** Blood transfusion in preterm neonates is an essential component of modern pediatric therapy. Although advantages of blood transfusion increasingly discovered in recent decades, it considered as an important risk factor of intraventricular hemorrhage (IVH). IVH can cause life-long disabilities or death. So we decided to assess the relation between blood transfusion and IVH in preterm neonates. This case control study conducted in November 2012 to April 2013 in Bandar Abbas-Iran. Preterm Neonates with birth weight less than 1500 g enrolled to this study. Exclusion criteria included: NICU admission, thrombocytopenia, asphyxia, respiratory distress syndrome and coagulopathy. First screening sonography carried out for all participants (100 neonates) in the first day of study. After blood transfusion in case group (50 neonates), second screening sonography carried out to investigate IVH. Collected information entered to SPSS version 16 and analyzed. In this study, case group contained 50 neonates with blood transfusion indications and control group contained 50 neonates with no blood transfusion indications. IVH was detected in 16% (8.50) of case group and 4% (2.50) of control group. Based on our findings, there is a significant relation between IVH and blood transfusion in preterm neonates ( $P= 0.046$ ). We also evaluated whether gestational age, birth weight and gender in preterm infants have relation with IVH or not, but we had found no statistical relation ( $P>0.05$ ). Our findings show blood transfusion in neonates is linked with risk of IVH. Thus we recommend paying more attention and being more cautious in transfusion procedure and after blood transferring, use screening means to diagnose possible IVH after in this group of neonates.

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**Key words:** Blood transfusion, Preterm neonates , Intraventricular hemorrhage

### 1. Introduction

Preterm infants with very low birth weight (less than 1500g) have developed less than term infants and many of them will need red blood cell (RBC) transfusions during the first weeks of life (Strauss and Widness 2010). Rate of RBC transfusion is even more in Extreme low birth weight (ELBW) infants (less than 1000g), while in the United States, approximately 90% of ELBW neonates will receive at least 1 RBC transfusion 2,3 600 ELBW infants born each week in the United States<sup>1</sup> receive approximately 3240 RBC transfusions during their hospitalization, with 60% to 80% of these given within 3 to 4 weeks after birth (Sacher et al., 1990; Maier et al., 2000).

Many physiological and pathological factors related to prematurity are responsible for the high rate of transfusion in these infants (Nabavizadeh et al., 2012; Abdel Mohsen et al., 2012; Mostafa et al., 2011; Kamel et al., 2011; Yang et al., 2012; Zhili, 2013; Qi et al., 2013). Multiple mechanisms including persistence of the fetal shunts, impaired peripheral vasoregulation, myocardial immaturity and positive pressure ventilation predispose prematurity born infants to the risk of low organ perfusion and RBC transfusion (Teitel, 1992; Merrill et al., 1995;

Evans and Kluckow, 1996). Transfusions of RBC are critically important to neonatal intensive care medicine. Indeed, in certain instances, RBC transfusions are lifesaving. However, each transfusion administered conveys risks and benefits. Some transfusion risks have been well defined; others less so and perhaps yet other risks are not even usually recognized as transfusion-related events (Christensen, 2012).

Although the known infectious risks of RBC transfusions from each donor exposure are traditionally focused on; but infections risk are extremely small and are decreasing over time with improvements in donor screening and laboratory infection surveillance, efforts have been made to limit transfusions and consequent donor exposures to the fewest number possible (Miyashiro et al., 2005; Dodd et al., 2009; H-L et al., 2009). Other complications of RBC transfusion can be intraventricular hemorrhage, necrotizing enterocolitis, lung injury, organ dysfunction, hemolytic transfusion reactions and transfusion related-sepsis. Some studies reported a higher mortality rate in children who received a transfusion compared with children and adolescents who did not received a transfusion (Kneyber et al., 2007; Székely et al., 2009; dos

Santos et al., 2011). One of the most important life-threatening complications of RBC transfusion in premature infants is intraventricular hemorrhage (IVH). Many reports suggest that IVH is also associated with prematurity (Linder et al., 2003; Ballabh et al., 2004; Brouwer et al., 2011, Christensen, 2012). After RBC transfusion, because of wide fluctuations in blood pressure and blood flow through the immature capillary beds are more likely to induce rupture and hemorrhage and cause mortality and morbidity (Christensen, 2012).

The aim of the present study was to assess the effects of a standard transfusion volume on the occurrence of the IVH in preterm infants in children hospital of Bandar Abbas-Iran.

## 2- Material and Method

This case control study conducted from November 2012 to April 2013. Target group consist 100 preterm neonates with birth weight under 1500g (VLBW) or who selected by simple sampling and divided to case and control groups. Parental consent was obtained for each neonate. The study protocol was approved by Hormozgan medical science university etic committee.

Patients with NICU admission, coagulopathies, bad general condition, thrombocytopenia, severe respiratory distress and asphyxia were excluded from this study. 50 preterm or VLBW neonates with no indication of blood transfusion enrolled to control group. To determine IVH, cerebral sonography carried out for entire patients. First screening sonography conducted on all patients in the first day of study, considered as referral sonography. Then, all patients in case group underwent blood transfusion according national guideline. Second cerebral sonography performed in seventh day of study, to find out if IVH occurred. All sonographies performed by a radiologist with a sonographic devise model Fukuda denshi CF sonic UF 7700. Demographic characteristics (age, sex and birth weight), clinical and Para-clinical finding (hemoglobin level, length of hospitalization and the volume of transfused blood, sings and sonographic evidences of IVH) for each neonates documented. After collecting necessary information, descriptive results of continuous variables were expressed as means and/or standard deviation. Comparison between two groups was done with chi-square test. SPSS software version 19.0 was used for all statistical procedures and differences were significant when P value were <0.05.

## 3- Results

During study period, 100 premature neonates (less than 32 weeks of gestation) with birth

weight less than 1500 g were excluded from all neonates who were born in Children and Shariati hospital of Bandar Abbas. The characteristics including gestational age, birth weight, gender and level of hemoglobin were not different between case and control groups (P=0.07). From all these neonates, 46(64%) were boys and 54(54%) were girls. All neonates have RBC transfusion indications due to Underlying disease (in 94% of neonates were respiratory distress syndrome, in 2% were icteric and 4% were other diseases).

In the first step, incidence of IVH in patients according their gender was assessed. From boys, 2(4.8%) patients and from girls, 6 (11.1%) patients diagnosed as IVH grade 1. Although incidence of IVH in girls were more than boys, statistical analysis showed no differences between them (P=0.121). In our study, no relation was found between gestational age and incidence of IVH (P>0.796). Also the relation between birth weight and occurrence of IVH was evaluated (Figures 1 and 2) and on the basis of our findings, birth weight has no statistical relation with IVH occurrence (P>0.05). The association between RBC transfusion and incidence of IVH evaluated between case and control groups. Patients with indication of RBC transfusion (50 patients) received at least 10cc/kg and some of them received 15cc/kg. After conducting the last cranial sonography to scre7k3en IVH in all neonates, incidence of IVH in case group was more than control group (Table 1). This difference was statistically significant (P=0.046).

**Table 1.** Sonography findings in both groups

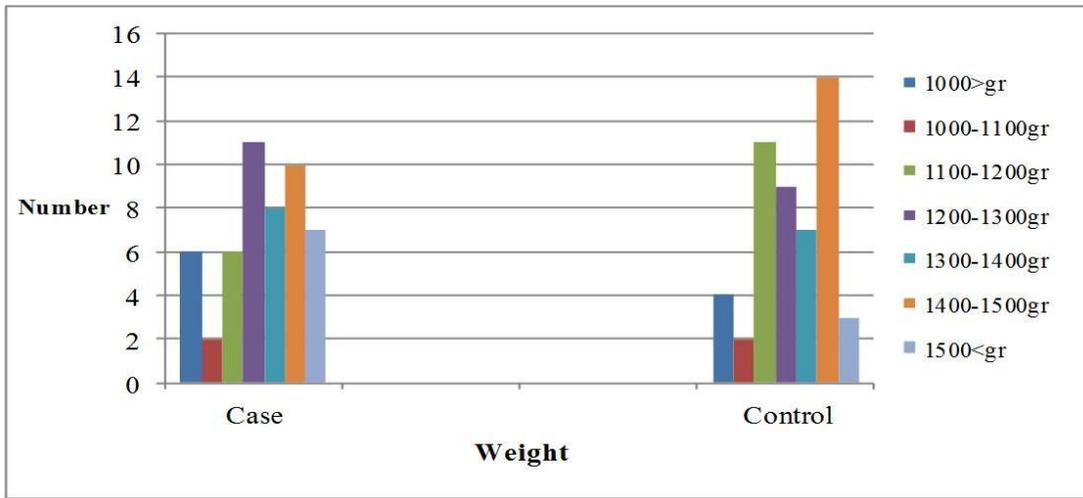
Sonography findings	Case group	Control group	P value
Normal	42	48	0.046
IVH degree one	8	2	

## 4- Discussion and Conclusion

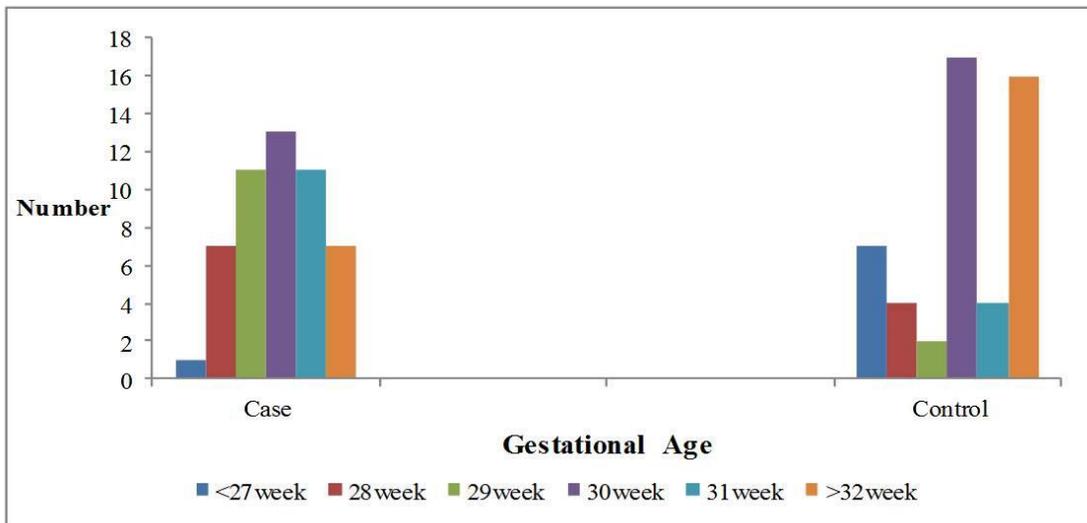
The present study was performed in order to examined the effectiveness cognitive therapy group and happiness training on changes in local cerebral blood flow in the frontal and temporal lobes of the major depressed patients with SPECT imaging techniques according to the objectives , hypotheses and used tools, findings of this study were studied and interpreted with two approaches, in the first approach was discussed to the interpretation of psychological test obtained scores from patients (Back 's depression and Argyle 's happiness) over three stages pre-test and post-test and two-month follow-up and on the second approach was addressed to the interpretation of taken brain scan and images view of nuclear medicine before and after stages psychological intervention mentioned above, which

the findings showed that both intervention (cognitive therapy group and happiness training ) was effective in reduction depressive symptoms compared to the

control group and significant difference was observed between the two groups in the pre-test and post-test and two-month follow-up stages.



**Figure 1.** Distribution of birth weight between case and control groups



**Figure 2.** Distribution of gestational age between case and control groups

The first finding of this study indicate that CBT group is effective in reducing depression in patients and the second findings of the present study is indicate the effectiveness of the happiness training in reducing depression of the patients. Also findings of the present study is indicated that between the rate of local cerebral blood flow in left and right frontal lobes, before and after cognitive therapy group and happiness training is significant difference in the two experimental and control group, in other words, both of these interventions is caused to increase blood flow in left and right frontal lobes in the depressed patients than to the control group which is indicate to increase perfusion after successful treatment in the

posterior anterior cingulate , in addition to , in the bilateral left frontal upper lobes and right lateral temporal cortex. Many study, showed that usually cerebral blood flow changes in depression after respond to pharmacotherapy, interpersonal psychotherapy are normative (Brouwer et al., 2011), also, in the same study found that after hormone therapy is increased both of frontal cortex blood flow and cognitive function. f MRI method to depressed patients found that depressed patients during doing cognitive tasks show increased blood flow in region right prefrontal (Brouwer et al., 2011). Study found that after taking medicine Prokestyn and Venlafaxine may increase metabolism and blood flow in the

frontal cortex. It can be said that the consistency and similar findings of this study to findings of these researches is indicate the highlight role and effectiveness of this part of the brain (frontal cortex) in decision making , judgment, thinking, learning and cognitive complex activity in humans and depression patient. Some important limitations of this study include: Decline and fall of 16 patients who attended at the first SPECT, but for various reasons such as fatigue, vocative off, and be a long , make tiredness SPECT method (the patient remains an hour under device), disagree, resistance and lack of pleased husband etc., were deterred from attending second scans. Also, for avoiding of much more research questions and hypotheses and other side regard to increasing the costs of the brain scans, between the four lobes of the brain have been evaluated only two lobes frontal and temporal and was ignored the parietal lobe and occipital, hippocampus, and etc. Therefore regard to the exist limitations is suggested used to the cognitive therapy group to Michael Frey ' s style and happiness training Fordyce ' s style in clinics, counseling centers, and etc to treat depression and attention and concentration and brain imaging techniques (SPECT and PET) will be used by psychiatrists, clinical psychologists, mental health professionals and mental and nervous professionals in research related to the area of the body – mental for accurate diagnosis and treatment of mental patients, to this way are achieved objective information and credible results on the etiology and treatment, also, using more number of the sample in the future same research, and attention of authorities and planners to the individual and social health area to necessary using happiness training techniques and social vitality and development , creation and infrastructure and is familiar with happiness culture and the proper explain of excitements in the families, schools and make healthy recreational centers in community are other applicable offers in this study.

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