ASSESSMENT OF NEONATAL ANEMIA AND ITS IMPACT IN NEONATAL ADAPTATION

Ionela Nicoleta Simion[1], Daniela Iacob[1], Andreea Fratila[1], Alexandra Nyiredi[1], C Ilie[1]

Abstract

Anemia in the newborn can result from bleeding, hemolysis and deficiency in red blood cell production. Anemia at birth is mainly due to bleeding and immune hemolysis. Anemia blood loss can occur through obstetrical accidents, occult blood loss and internal bleeding. A retrospective study conducted in 236 anemic infants in the early neonatal period, hospitalized for neonatal anemia between January 1, 2010 and December 31, 2012 in "Bega" Clinic of Neonatology in Timisoara, identified an accumulation of significant risk factors influencing prognosis and treatment. Among infants with neonatal anemia, a total of 147 were premature. The most common cause of hemolytic anemia was the blood group incompatibility between mother and fetus, the prevalence being 9.55%.

Keywords: neonatal anemia, infants, gestational age, prematurity, pathology at birth

Introduction

In adults, the classic triad of hemolytic anemia is anemia, reticulocytosis and hyperbilirubinemia. Anemia in the early neonatal period can occur with minimal changes in hemoglobin values and even without increased reticulocyte values and has multiple etiologies, which can be grouped into three broad categories: isoimmunization, congenital and acquired defects of the erythrocyte [1]. The most common cause of hemolytic anemia is the blood group incompatibility between mother and fetus.

Anemia in the newborn period is divided into: hemolytic anemia, congenital abnormalities of erythrocyte membrane and hereditary erythrocyte enzyme abnormalities (deficiency of glucose-6-phosphate dehydrogenase and deficiency of piruvatkinasis) [1,2]. Hemoglobinopathies are congenital deficiency anemia hemoglobin and are divided into two groups: structural defects and defects in hemoglobin synthesis (thalassemia syndromes), which include: alpha thalassemia, hemoglobin H disease (deletion of three genes), fetal hydrops syndrome with hemoglobin. Bart, gamma thalassemia and beta thalassemia [2,3]. Hemolytic anemia due to won defects is divided into: anemia associated with infections, hemolytic anemia due to maternal autoimmune disease and neonatal anemia due to ineffective red cell production [1,2,3].

Hemoglobin values from umbilical cord increased steadily between 28 and 40 weeks of gestation. After expulsion, hemoglobin values and the number of erythrocytes decrease more quickly and early in premature infants. The speed and the size of the drop is proportional to the immaturity of the child [4,5]. In those with weight between 1.2 and 2.3 kg, hemoglobin values decrease to 9.6±1.4 g%, while in those with a birth weight less than 1.2 kg, the hemoglobin values decrease to 7.8±1.4 g%. Some children tolerate very low hemoglobin values without any sign of tissue anoxia, while others suffer obvious clinical problems, and the rapidity with the level of decreased can be significantly lower, that requires transfusion [6,7].

Anemia in early neonatal period is mainly due to bleeding and immune hemolysis. Hemorrhagic anemia can be caused by: obstetrical accidents, occult blood losses and internal bleeding. Occult losses before birth may be due to either fetal-maternal hemorrhage or transfusion between twins or placental hemorrhage [8,9]. The treatment management early after birth is crucial to a pale and shocked newborn: maintenance free upper airway and administer oxygen, umbilical artery catheterization for determination of hemoglobin, bilirubin, Astrup parameters, Coombs test, administration of plasma expander to maintain blood volume, finding the cause of bleeding. Jaundice control with phototherapy and transfusions are the most important aspects of therapy in the neonatal period [10,11,12]. Once the diagnosis is established, the infant will receive daily supplements of folic acid to meet the increased demands of the bone marrow in the process of erythropoiesis[13,14,15].

Materials and methods

The study material is represented by a homogeneous group of 236 infants with neonatal anemia during the years 2010-2012 Neonatology Clinic "Bega" in Timisoara. During this period there were 7703 births, of which 643 were premature babies. The cases studied were reviewing the various parameters that could be considered at risk for developing anemia in the newborn.

[1]University of Medicine and Pharmacy Timisoara-Romania, Department of Neonatology
E-mail: ionela_simion2003@yahoo.com, danielariacob@yahoo.com, andreeabg@yahoo.com, alexnyiredi@gmail.com, constantinilie@umft.ro

Anemia neonatal of biologically was defined as a lack of hemoglobin (Hb <15g%). Particular attention was given to the number of erythrocytes (<4x106/mm3), hematocrit (<45%) and APGAR index, etc. Among infants with neonatal anemia, a total of 147 infants were premature. In all cases studied was prepared a special form in which the parameters were recorded anamnestic and clinical course. All parameters registered were essential to identify cases at risk of developing anemia in the early neonatal period. These parameters were analyzed in isolation and sequencing could make a contribution in the realization or worsening anemia.

The study is retrospective and seeks cumulative risk assessment and identification to the most at risk. Based on the assessments made by the study, we believe that identifying the percentage of cases with increased risk of developing anemia may be higher than those reported so far, and the purpose of this goal cannot be other than the establishment of early treatment and especially an effective prophylaxis, which could lead to anemia neonatal morbidity. The data collected in this study were processed using SPSS Statistics 17.

Results and discussions

In 2010-2012, in the Department of Neonatology "Bega" Timişoara were born a total of 236 children with a diagnosis of neonatal anemia. They were followed and studied under observation sheets of neonatology service in Timisoara. The prevalence of neonatal anemia in relation to the population of newborns in 2010-2012 is 3.06%. Share anemia is within 2.32% and 11.19% premature. We statistically analyze these cases the following parameters: Sex; The area of origin of the mother; Age of the mother; Weight at birth; gestational age; Hemoglobin values; Number of E; The values of mean corpuscular volume (MCV); Apgar score; The most common and less common 10 etiologies associated with neonatal anemia and the minimum values of Hemoglobin, in which the patient required blood transfusion.

Distribution of neonatal anemia by sex. Regarding gender distribution, one can observe a slight increase in the prevalence of female to male sex. The prevalence in males is 51.27% and female sex prevalence is 48.73%.

Distribution by origin area of mother. In urban areas, there is an increased prevalence of anemia compared to rural areas. Research shows that in rural areas, the prevalence is 46.19% compared to urban areas, where the prevalence is 53.81%. This increase is probably due to greater addressability of patients to the doctor attributed to the higher socioeconomic level, taking as evidence clearer and more extensive monitoring of pregnant women.

Mother's age. Regarding of maternal age at birth, studies show that most mothers who have children with anemia aged between 25 and 35 years, 63.98% of the study group. There is observed a marked increase in the incidence of neonatal anemia in newborns whose mothers are aged in risk groups:<18 years (2.97%) and>35 years (12.29%).Most mothers who have children born with anemia, are aged between 25 and 35 years, which shows that most children with anemia were born at a fertile age, but extremely busy both physically (age ascension at work) and mentally (tendency towards rumination on various topics, and put loads hormone-premenopausal).

Birth weight. Depending on the weight at birth, infants are divided into: preterm VLBW - with a birth weight below 1.000 grams, if they have a small share in the group of cases studied, only 1.69%.; preterm LBW with a birth weight between 1000-1500 grams, the study group represented 3.39%; preterm degree II, with a birth weight between 1500-2000 grams a procent of 5.93%.and preterm degree I, with a birth weight between 2000-2500 grams, with a procent of 11.02%. In total, prematurity by weight has a prevalence of 22.03%, which demonstrates that infants with a birth weight below 2.500 grams have a high risk of neonatal anemia. Newborn babies with normal birth weight over 2500 grams, which represent 77.97% of the study group. (Fig. 1)

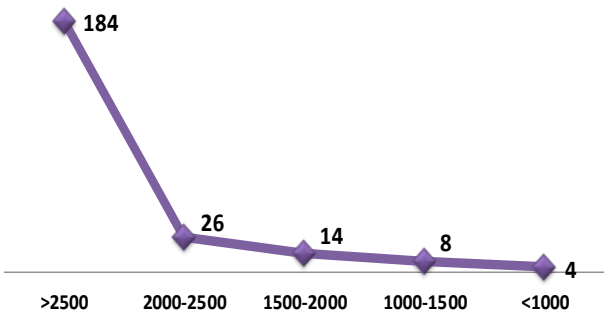

Fig. 1. The distribution of the weight of anemia neonatal birth.

Gestational age is the other criterion in infants anemic analysis. It is noted that prematurity plays an important role in the development of neonatal anemia, the prevalence is 62.28%. Most cases are found at a gestational age of 37-40 weeks (60.19%), followed by infants with gestational age of 33-36 weeks (22.03%). Extreme gestational ages, below 32 weeks, have a prevalence of 2.96%. Infants at term have a share of 37.71%, which leads to the conclusion that the risk of neonatal anemia is higher for preterm than for term infants. (Fig.2, Fig.3)

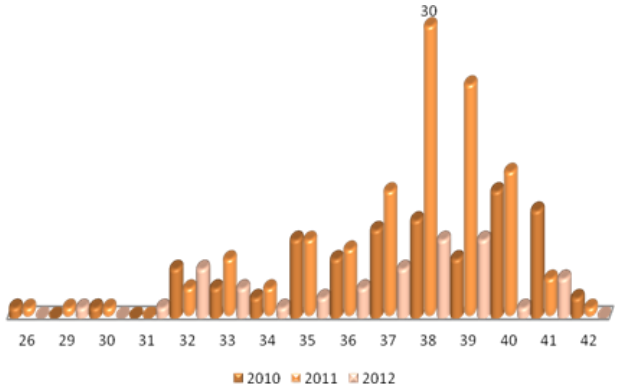

Fig. 2. Distribution of neonatal anemia after gestational age and years.

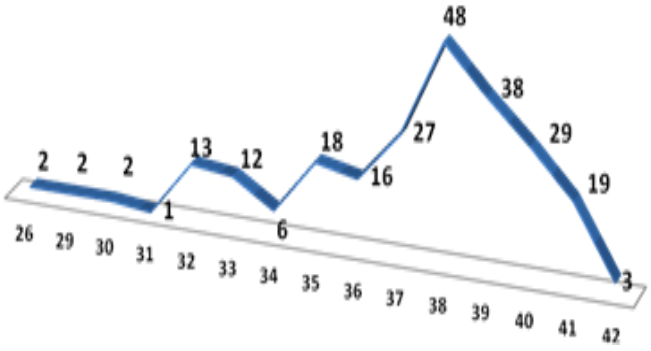

Fig.3. Distribution of neonatal anemia after gestational age.

Hemoglobin levels. In order to define neonatal anemia were considered hemoglobin levels below 15 g%. Thus there was a higher prevalence of hemoglobin values between 12 and 14.9 (70.06% in the preterm group and 73.30% in the reference group). (Table 1, Fig.4) This means that the degree of anemia present in these infants is mild.

Hematocrit values. Although relevant values to define anemia neonatal below 45% in the group also included patients with hematocrit values above this value (Table 2). Conventionally, we determined that hemoglobin is a major parameter in the diagnosis of neonatal anemia. Thus, as a parameter precipicant Ht is a factor of the degree of anemia. In this distribution we have seen that the rate of 89.11% of premature infants had Ht values between 30 and 45%.

Hb (mg%)	Year of Birth			Total
	2010	2011	2012	
<10	3	3	3	***9***
10-11,99	10	16	9	***35***
12-14.9	32	54	17	***103***

Table 1. Distribution of hemoglobin values in the study group by year of birth.

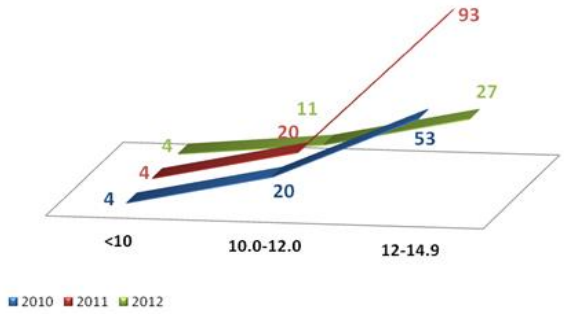

Fig. 4. Distribution of hemoglobin values in the study group by year of birth.

Table 2. Distribution of Ht values (%) in the study group.

Ht (%)	Year of birth			Total
	2010	**2011**	**2012**	
<30	4	7	4	15
30-45	67	106	37	210
>45	6	4	1	11

Distribution of red blood cells. The number of red blood cells is a highly sensitive parameter neonatal anemia. These are the ones that change the number in various pathologies anemia erythrocytes are cells that disrupted secondary pathogenic mechanisms.(Table 3, Table 4, Fig. 5)

Distribution of mean corpuscular volume (MCV). In the group of preterm infants, the proportion MCV below 90 fl, is 5.44%, and in the healthy infants this procent is 10.11%, which does not show a direct correlation between premature and NN VEM. (Fig 6)

Table 3. Distribution E (mil./mm3) in group of premature infants.

Nr. E (mil./mm^3)	Year of birth			Total
	2010	2011	2012	
<3	4	6	7	***17***
3-3.4	6	16	12	***34***
3.5-4	21	35	7	***63***
>4	14	16	3	***33***

Table 4. Distribution E (mil./mm3) in group of healthy infants.

Nr. E (mil./mm^3)	Birth year			Total
	2010	2011	2012	
<3	1	2	3	*6*
3-3.4	8	4	4	*16*
3.5-4	10	27	4	*41*
>4	13	11	2	*26*

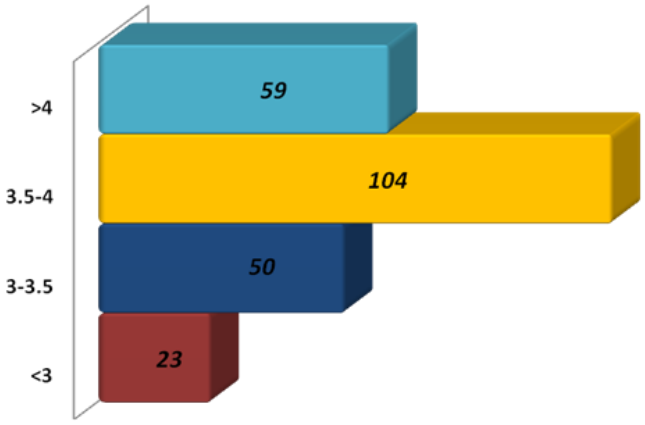

Fig.5. Distribution E (mil./mm3) in the study group.

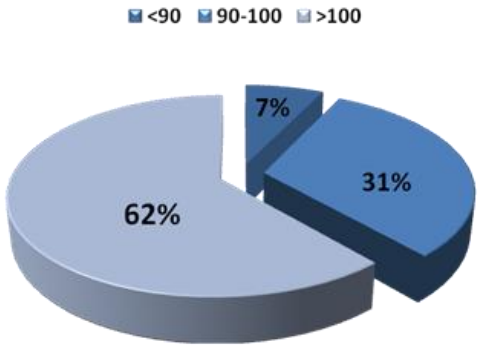

Fig. 6. Distribution of MCV (fl) in the study group.

The Apgar score is a very important criterion in the investigation of neonatal anemia. APGAR score between 8 and 9 has the highest prevalence of 65.25% in the study group. APGAR score 10 children with neonatal anemia developed, with an incidence of 15.25%. The Apgar score below 5 were presented only 1.27% of the children, showing that a score below 5 is not incriminated in the development of anemia. (Table 5)

A significant proportion have children with Apgar score between 5 and 7, representing 19.49% of the children. It seems APGAR score not affect the subsequent development of anemia.

The most common and less common 10 etiologies associated with neonatal anemia. In the study group has made use of more diagnoses, to develop a complete diagnosis, most infants with a complex pathology. (Table 6)

Table 5. Apgar score in prematurity group of infants.

APGAR score	Birth year			Total
	2010	2011	2012	
2	0	2	0	**2**
3	0	0	0	**0**
5	1	1	3	**5**
6	3	4	2	**9**
7	15	6	2	**23**
8	9	19	8	**36**
9	14	33	8	**55**
10	3	8	6	**17**

Table 10. The most common and least common etiologies associated with neonatal anemia.

	Etiologies	Total
1	Placenta praevia	1
2	Circular umbilical cord	6
3	Cephalhematoma right parietal	1
4	Twins	7
5	Acute intrapartum hypoxia	1
6	Acute intrapartum hypoxia+ ABO incompatibility	1
7	Circular umbilical cord+ acute intrapartum hypoxia+ventricular septal defect	1
8	Intrauterine growth restriction	1
9	Jaundice	7
10	Prematurity+sepsis	1
11	Prematurity+ acute intrapartum hypoxia	4
12	Circular umbilical cord+acute intrapartum hypoxia	5
13	Cesarian section	7
14	Prematurity	22
15	Other neonatal anemias	22

Minimum values of Hemoglobin, in which the patient required blood transfusion. A number of patients were diagnosed with severe anemia. with hemoglobin values below 10 g%.

Comparative analysis of the study group shows that neonatal anemia is better defined by reducing the total mass of circulating red blood cells than the decrease of hemoglobin value. For the diagnosis of neonatal anemia, in particular to preterm babies, it is necessary to collect all hematologic data, where the hematocrit is the most important. Clinical manifestations of neonatal anemia correlates significantly with some etiological perinatal circumstances and it is directly proportional to the damage degree of the total mass of circulating red blood cells. The assessment of preterm babie hematologic homeostasis damage, allows us to estimate the risk of developing late anemia[15].

Conclusions

1. Anemia in the newborn can result in bleeding, hemolysis and deficient in red blood cell production.

Anemia at birth is mainly due to bleeding and immune hemolysis.

2. Anemia blood loss can occur through accidents obstetrical, occult blood loss and internal bleeding.

3. A retrospective study conducted in 136 anemic infants in the early neonatal period, identified an accumulation of significant risk factors dictating the frequency and association prognosis and treatment.

4. The most common cause of hemolytic anemia is the blood group incompatibility between mother and fetus, as results from the study in the 136 newborns with anemia, where the incidence of anemia group incompatibility between mother and fetus is 9.55%.

5. Obstetrical accidents occur through normal umbilical cord rupture if precipitated unassisted births, but when the load as normal, but there are certain vascular abnormalities such as aneurysm of the umbilical cord, short cord circular cordon. It also can cause traction with forceps cord rupture.

6. Occult losses before birth may be due to either fetal-maternal hemorrhage or transfusion between twins or placental hemorrhage.

7. Injuries to internal organs during traumatic births are the most common causes of internal bleeding in the newborn. The most common areas of hemorrhage are subaponevrotic production, subperiosteal (cephalhematoma) and subarachnoid brain, liver, lungs, kidneys and spleen.

8. Neonates undergoing chronic blood loss in utero, at birth the different clinical conditions, from those with severe anemia requiring resuscitation immediately after birth to the asymptomatic mild anemia, requiring only iron supplement to increase hemoglobin and restoring iron stores.

9. The management immediately after birth is crucial to a newborn pale, shocked. Jaundice with phototherapy and control transfusions are the most important aspects of therapy in the neonatal period.

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Correspondence to:

Ionela Nicoleta Simion
University of Medicine and Pharmacy,
Department of Neonatology,
Piaţa Eftimie Murgu, No.2, 300041, Timisoara-Romania
E-mail: ionela_simion2003@yahoo.com