pISSN:2349-5707 Volume:12,Issue 12,December-2025 eISSN:2349-5715

CLINICAL AND NEUROLOGICAL ASPECTS OF HEMOLYTIC DISEASE OF THE NEWBORN

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Abstract: Hemolytic disease of the newborn (HDN) is a perinatal pathology that develops based on immunological mechanisms, characterized by rapid destruction of erythrocytes, leading to hyperbilirubinemia and anemia. Early diagnosis of the disease is crucial for reducing neonatal complications and lowering the incidence of kernicterus and mortality. This article analyzes the pathogenesis of HDN, modern diagnostic methods, the statistical effectiveness of laboratory and instrumental assessments, prenatal diagnostic opportunities, and prognostic factors.

Keywords: Hemolytic disease of the newborn; neonatal hemolysis; Rh incompatibility; ABO incompatibility; early diagnosis; prognosis; fetal anemia; bilirubin; bilirubin-induced neurological dysfunction; middle cerebral artery Doppler; intrauterine transfusion.

Introduction

Hemolytic disease of the newborn (HDN) is one of the major global challenges in neonatology and perinatal medicine. According to the World Health Organization, more than 24 million fetuses and newborns are born each year with anemia containing a hemolytic component, and immunological conflict (most commonly due to RhD or ABO systems) is identified in 3—5% of them. Severe complications associated with HDN — kernicterus, sensorineural hearing impairment, epileptic syndrome, and delayed psychomotor development — remain leading causes of neonatal disability.

Over the last 20 years, due to immunoprophylaxis programs, cases of Rh isoimmunization have decreased by up to 90%. However, ABO incompatibility, fetomaternal hemorrhage confirmed by the Kleihauer—Betke test, and diseases associated with less common erythrocyte antigens (Kell, Duffy, Kidd) have gained significant clinical relevance.

Materials and Methods:In our study, 30 newborns diagnosed with hemolytic disease and treated at the "Department for Newborns at Risk" of the Andijan Regional Multidisciplinary Childrens Medical Center were selected. Among them, 15 cases were due to ABO incompatibility and 15 due to Rh incompatibility.

Gender distribution showed that the majority of cases occurred in male infants, accounting for 70% of the study population, while female infants represented 30%.

Gender distribution

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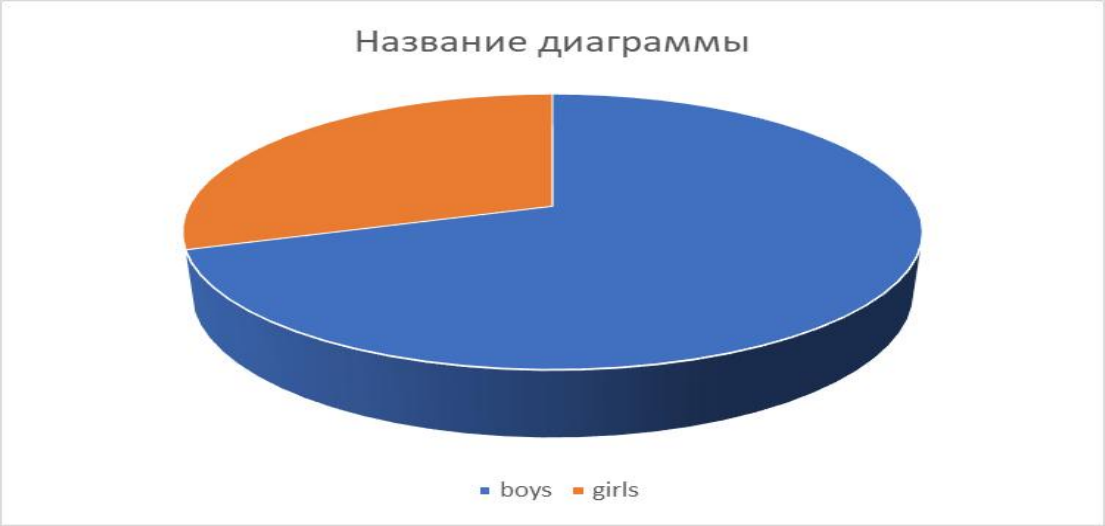
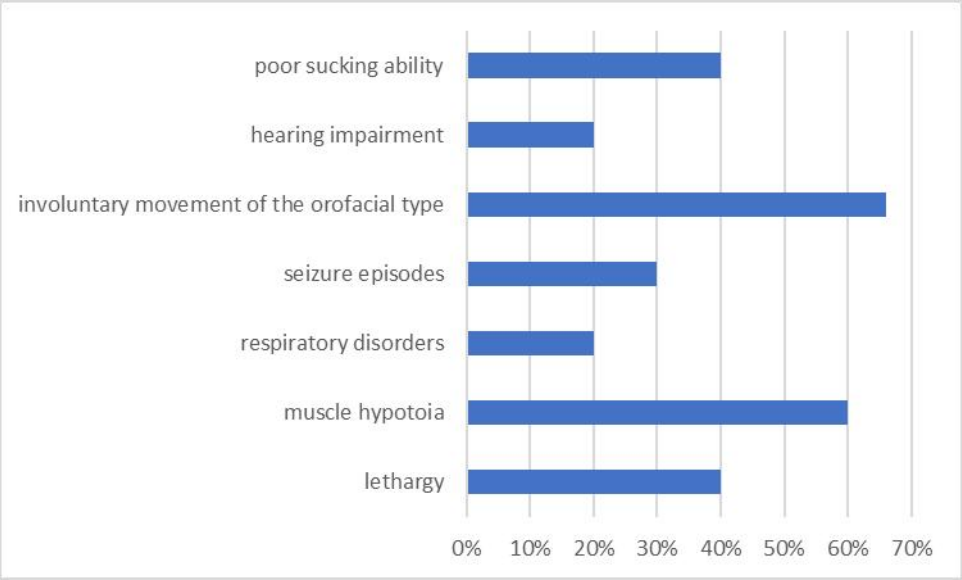


Clinical neurological analyses showed that early onset of jaundice — appearing within the first 24 hours — was observed in nearly 60% of infants in the study group; hepatosplenomegaly in 100%; lethargy in 40%; muscle hypotonia in 60%; respiratory disorders in 20%; seizure episodes in 30%; involuntary movements of the orofacial type in 66%; hearing impairment in 20%; and poor sucking ability in 40%.

Frequency of clinical neurological signs



Pre-treatment laboratory examinations of the patients showed that the increase in total serum bilirubin levels occurred mainly at the expense of unconjugated (indirect) bilirubin. It was also observed that the total protein level had correspondingly decreased. Liver enzyme analysis revealed that AST and ALT levels remained almost unchanged. According to standard protocols, the patients received appropriate therapeutic measures, including infusion therapy, phototherapy, exchange transfusion, intravenous immunoglobulin administration, and enterosorbents. In addition, in order to prevent toxic-metabolic damage to the central nervous system, nootropic agents (pantocalcin) and metabolic-enhancing medications (levocarnitine) were administered. The treatment duration ranged from 1 to 6 months.

pISSN:2349-5707 Volume:12,Issue 12,December-2025 eISSN:2349-5715

Labaratory Indicators before and after treatment

Indicators	Befofe treatment	After treatment
Total Bilirubin (µmol/L)	282.6	55.4
Unconjugated Bilirubin (µmol/L)	255	30
Conjugated Bilirubin (µmol/L)	17.6	15.4
ALT (U/L)	17.6	15.3
AST (U/L)	22.6	19.3
Total Protein (g/L)	46.36	54.2

In the study group, 10—15 days of standard treatment produced positive changes in all patients; however, neurological symptoms persisted for 3—6 months. Monthly neurosonographic examinations were performed, and appropriate therapeutic recommendations were provided.

Discussion : ofindings are consistent with the current literature: ABO incompatibility is more common, but clinically significant hemolysis in most newborns tends to be mild or moderate and usually requires only phototherapy. A positive DAT in ABO-HDN is not always present and shows a weaker correlation with clinical severity compared with Rh incompatibility. Rh incompatibility is characterized by more severe anemia, higher rates of positive DAT, and increased need for IVIG and exchange transfusion, which has been confirmed by recent reviews and studies.

Modern prenatal strategies, including sequential monitoring of antibody titers and Doppler assessment of the middle cerebral artery (MCA), allow timely intrauterine transfusion or planned delivery in centers equipped with advanced neonatal intensive care. The literature reports a significant reduction in severe outcomes following the introduction of anti-D prophylaxis; however, other antibodies (anti-K, anti-c, etc.) remain clinically important.

Conclusion: hemolytic disease of the newborn (HDN) continues to be a serious issue in perinatal medicine. A retrospective analysis of 30 cases demonstrated that ABO incompatibility generally leads to milder forms, whereas Rh incompatibility is associated with more severe manifestations and frequently requires blood transfusion. Modern prenatal and neonatal strategies (screening, anti-D prophylaxis, antibody titer monitoring, and Doppler MCA evaluation) substantially reduce severe outcomes; however, early diagnosis and access to neonatal intensive care remain key factors in decreasing mortality and neurological complications.

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