CLINICAL EVALUATION OF PHOTOTHERAPY EFFECTIVENESS IN NEWBORNS WITH PHYSIOLOGICAL AND HEMOLYTIC JAUNDICE

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Abstract: Neonatal jaundice is one of the most common conditions in newborns, with potential implications for infant health if not managed properly. Physiological and hemolytic jaundice differ in etiology, bilirubin levels, and clinical progression, requiring tailored treatment approaches. Phototherapy remains the primary and safe method to reduce bilirubin levels in neonates. This study presents a clinical evaluation of phototherapy effectiveness in newborns with physiological and hemolytic jaundice. Parameters such as bilirubin reduction rate, treatment duration, clinical improvement, and possible side effects were analyzed. The results demonstrate that phototherapy is effective in both types of jaundice, with faster bilirubin reduction in physiological jaundice and longer treatment courses required for hemolytic jaundice. The findings highlight the importance of individualized treatment strategies in neonatal care.
Keywords: neonatal jaundice, physiological jaundice, hemolytic jaundice, phototherapy, bilirubin, newborns, neonatal care, treatment effectiveness

Neonatal jaundice is a common clinical condition affecting a significant proportion of newborns worldwide. It is characterized by hyperbilirubinemia, resulting from either physiological immaturity of the liver or pathological hemolysis. Physiological jaundice typically develops within the first week of life and resolves spontaneously due to transient inefficiency in bilirubin conjugation. In contrast, hemolytic jaundice arises from increased red blood cell destruction caused by blood group incompatibilities, hereditary enzyme deficiencies, or hemolytic diseases, leading to rapid bilirubin accumulation and a higher risk of bilirubin-induced neurological dysfunction. Phototherapy is widely recognized as the first-line, non-invasive treatment for neonatal hyperbilirubinemia. The mechanism involves the photoisomerization of unconjugated bilirubin into water-soluble forms, which can be excreted without hepatic conjugation. While its general effectiveness is well-established, the response to phototherapy may

vary depending on the type of jaundice, the severity of hyperbilirubinemia, and individual neonatal factors. Comparative studies of phototherapy outcomes in physiological versus hemolytic jaundice remain essential to optimize treatment protocols and reduce the risk of acute and chronic complications. The study included two groups of newborns: one with physiological jaundice and another with hemolytic jaundice. Physiological jaundice group: Phototherapy resulted in a rapid decrease in serum bilirubin levels. Most neonates exhibited significant clinical improvement within 24–48 hours, and the average duration of phototherapy was relatively short. No major complications were observed, and minor side effects included mild skin erythema in some infants. Hemolytic jaundice group: Although phototherapy effectively reduced bilirubin levels, the rate of decline was slower compared to the physiological group. The average duration of therapy was longer, and close monitoring of bilirubin levels was necessary to prevent complications. Despite the slower response, phototherapy successfully prevented bilirubin neurotoxicity, and side effects remained minimal. Quantitative analysis showed that physiological jaundice neonates experienced a mean bilirubin reduction of approximately 3–4 mg/dL per 24 hours, whereas hemolytic jaundice neonates showed a mean reduction of 1.5–2 mg/dL per 24 hours. This indicates a more intensive phototherapy requirement in hemolytic cases to achieve safe bilirubin levels. The findings confirm that phototherapy is a highly effective and safe intervention for managing neonatal jaundice of both physiological and hemolytic origin. The faster bilirubin clearance observed in physiological jaundice reflects the transient nature of hepatic immaturity and moderate bilirubin load. Hemolytic jaundice, with higher bilirubin production due to accelerated hemolysis, requires longer and more intensive phototherapy while maintaining careful clinical monitoring. The study also highlights the importance of individualized treatment strategies. Variables such as the etiology of jaundice, initial bilirubin concentration, gestational age, and overall neonatal health must be considered when determining the intensity and duration of phototherapy. This tailored approach minimizes the risk of bilirubin-induced neurological damage, shortens hospital stays in physiological jaundice cases, and improves outcomes in hemolytic jaundice. Moreover, the minimal adverse effects observed in both groups emphasize phototherapy's safety when standard monitoring protocols are followed. International literature supports these findings, demonstrating that early initiation of phototherapy, guided by bilirubin levels and clinical risk factors, significantly reduces the need for exchange transfusions and prevents severe complications. In conclusion, the study reinforces phototherapy's role as the cornerstone of neonatal jaundice management and underscores the need for a differentiated, evidence-based approach depending on the jaundice type. The results of

this study demonstrate that phototherapy is an effective and safe treatment method for neonatal jaundice in both physiological and hemolytic forms. Newborns with physiological jaundice showed a faster decrease in bilirubin levels, shorter treatment duration, and rapid clinical improvement. In hemolytic jaundice, although bilirubin reduction was slower and therapy required closer monitoring and longer duration, phototherapy effectively prevented bilirubin-induced neurological complications. The study emphasizes the importance of individualized phototherapy protocols based on the type of jaundice, initial bilirubin levels, and the overall condition of the newborn. Early initiation and careful monitoring of phototherapy not only optimize treatment outcomes but also minimize potential adverse effects, ensuring safe and effective management of neonatal jaundice. In conclusion, phototherapy remains the cornerstone of neonatal jaundice management, and differentiated approaches depending on the etiology of jaundice are crucial for improving neonatal outcomes.

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