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Original Research Article

# Early Isomerization of Bilirubin in Phototherapy of Neonatal Jaundice at Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar

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## Abstract

**Background:** Jaundice is a complicated illness that affects everyone in the modern society. Hyperbilirubinemia, or elevated bilirubin levels in the newborn's body, is the true cause of jaundice. Common signs of jaundice include skin, mucous membranes, and a yellowing of the skin (Kernicterus). In both term and preterm infants, jaundice usually arises during the first week following delivery and goes away on its own in one to two weeks. Jaundice caused by accumulation of bilirubin serum. Elevated bilirubin is the most common morbidity during the neonatal period, and 5–10% of pregnancies require treatment for pathological jaundice.

**Methods:** From July 2022 to December 2022, newborns admitted to the neonatal unit of the Department of Pediatrics at the ANMMCH in Gaya, Bihar, were the subjects of this randomized controlled trial. After meeting the inclusion and exclusion requirements, 258 patients in total were enrolled in the trial to assess the drop in serum bilirubin following continuous versus intermittent phototherapy for the treatment of newborn jaundice.

**Results:** The patients' average age was 3.89±1.83 (p=.91) days. The mean bilirubin levels at baseline were 17.56 mg/dl±1.42 (p=.36), whereas the mean levels at follow-up were 12.85 mg/dl±1.65 (p=.95). The mean difference in bilirubin levels between follow-up and baseline was 4.7 mg/dl±1.19 (p=.32). The mean difference in bilirubin levels between the follow-up and baseline measurements for the neonates in group A was 4.78 mg/dl±1.20 (p=.32). The babies in group

B showed a mean difference in bilirubin between the baseline and follow-up measurements of 4.63 mg/dl±1.18 (p=.32). For both groups A and B, there was a statistically insignificant difference in the mean age at admission, mean baseline bilirubin, mean follow-up bilirubin, and mean decrease in serum bilirubin.

**Conclusion:** Phototherapies that are intermittent or continuous have been found to be equally beneficial. In place of continuous phototherapy, intermittent phototherapy might be a standard technique in neonatal care units due to its extra benefits.

**Keywords:** Polar stereoisomers, Photoisomer, Kernicterus, phototherapy.



## Introduction

Jaundice is the most common illness in neonates. Breastfeeding causes jaundice in about 10% of newborns during the first month of life. A baby may potentially experience jaundice in the first week of life.[1] Bilirubin is a synthetic yellow pigment that may be dangerous, especially for infants.[2] The bilirubin does not undergo chemical conjugation. The name "jaundice" originated from the French word "jaune," which means yellow. Elevated bilirubinaemia is characterized by jaundice, which implies that most of the high bilirubin levels may not be in chemically conjugated form.[3] Jaundice is a symptom of elevated bilirubin levels, specifically when the Haem group-producing substrate of bilirubin is exceeded. It's a part of hemoglobin and hemolytic illness; the most prevalent victims are newborns and those with jaundice. Spherocytosis is an inherited condition caused by a lack of glucose-6-phosphate dehydrogenase. Because bilirubin is deposited in the skin's lining, newborns with jaundice typically have white eyes and yellow skin, predominantly on the sclera. elevated bilirubin in the blood.[6] It's possible to have black urine and yellow stools.[7] Jaundice typically appears in the first week of life in babies and is not a serious concern. Brain damage can be brought on by jaundice or continuously elevated bilirubin levels.[8]

## Material and Methods

From July 2022 to December 2022, this randomized control study was carried out at the neonatal unit of Pediatrics Department, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar. 258 patients in all were chosen using non-probability consecutive sampling, with 129 in each group. The test's 95% confidence interval, 80% power, and 7.31± 0.48 mg/dl serum bilirubin decrease after intermittent phototherapy and 7.43 ± 0.07 mg/dl serum bilirubin decrease after con-

tinuous phototherapy were used. When evaluated in a laboratory setting, a blood indirect bilirubin level of higher than 12 mg/dl in term infants was considered neonatal jaundice. Adhering to an on-off schedule for phototherapy application is known as intermittent phototherapy.

Full term newborns (≥37 weeks), aged >24 hours and ≤10 days, and having a serum indirect bilirubin level between 12 to 20 mg/dl were the inclusion criteria. APGAR at five minutes over six (as indicated in the patient's hospital file). Patients requiring ventilator support, endotracheal intubation, or peritoneal dialysis met the exclusion criteria. Patients who have significant congenital malformations such as cardiac, skeletal, renal, dysmorphism, etc., as well as sepsis (positive blood culture, fits, refusal to feed, platelets <50000) should also be considered.

The parents (mother or father, if available) of the infants who met the inclusion criteria and were enrolled in the study from the Neonatal unit of Children ANMMCH, Gaya, Bihar, provided their informed consent. In this trial, 258 newborns were enrolled, and the mean baseline bilirubin level and the male/female ratio were matched across groups A and B. While group B received phototherapy on an intermittent basis, group A received phototherapy continuously. The same manufacturer and age of equipment were used to provide phototherapy to both groups. For both groups, the height of phototherapy light (the separation between the light source and the infant) was maintained at a constant level. After 36 hours, the follow-up bilirubin was assessed. Every newborn was divided into two groups at random using a lottery. Whereas patients in Group B received intermittent phototherapy (one hour on and thirty minutes off), patients in Group A received continuous phototherapy (2 hours on and 20 minutes off). The researcher saw phototherapy being administered on and off. Before beginning phototherapy, every eight hours while receiving phototherapy, and on the thirty-sixth hour, the researcher obtained blood samples and sent them to the hospital's laboratory to check the serum bilirubin levels. The investigator obtained the data from the laboratory and recorded the serum bilirubin levels on the Proforma. To prevent confounders and bias in the study's findings, exclusion criteria were scrupulously adhered to. All the laboratory investigations were done from hospital laboratory.

SPSS version 16 was used to analyze the data. Quantitative data were presented as mean ± SD, including age, serum bilirubin at the beginning of phototherapy, and serum bilirubin at the 36-hour mark. Qualitative data, including gender, were displayed as frequencies and percentages. A t-test was utilized to compare the average drop in serum bilirubin levels between the two groups, with p values of less than 0.05 being deemed statistically significant. Tables with

all of the findings were presented.

## Results

In our investigation, 258 patients were involved. A mean of 3.89±1.83 (p=0.91), a mean baseline bilirubin of 17.56 mg/dl±1.42 (p=0.36), a mean follow-up bilirubin of 12.85 mg/dl±1.65 (p=0.95), and a mean difference of 4.7 mg/dl±1.19 (p=0.32) were observed among the patients.

When the babies in group A were admitted, their mean age was 3.91±1.82 (p=0.91), their mean baseline bilirubin was 17.64 mg/dl±1.37 (p=0.36), their mean follow-up bilirubin was 12.86 mg/dl±1.53 (p=0.95), and their mean difference between the baseline and follow-up bilirubin was 4.78 mg/dl±1.20 (p=0.32). The babies in this group A received continuous phototherapy.

Upon admission, the mean age of group B babies receiving intermittent phototherapy was 3.88±1.84 (p=0.91). The mean bilirubin at baseline was 17.48 mg/dl±1.47 (p=0.36), the mean bilirubin at follow-up was 12.85 mg/dl±1.76 (p=0.95), and the mean difference between the bilirubin at baseline and follow-up was 4.63 mg/dl±1.18 (p=.032). Table 2 displays the distribution of genders.

**Table 1: Type of phototherapy, age of patient, baseline bilirubin, follow-up bilirubin, and the difference b/w baseline and follow-up bilirubin**

| Type of phototherapy given to patients | Age of patients in days | Baseline bilirubin | Follow up bilirubin after 36 hours | Difference between baseline and follow-up bilirubin |
|---|---|---|---|---|
| Continuous mean | 3.9109 | 17.6434 | 12.8605 | 4.7822 |
| N | 129 | 129 | 129 | 129 |
| Std. Deviation | 1.8234 | 1.37238 | 1.53279 | 1.20231 |
| % Of total sum | 50.2% | 50.2% | 50.0% | 50.8% |
| Intermittent mean | 3.8857 | 17.4814 | 12.8473 | 4.6341 |
| N | 129 | 129 | 129 | 129 |
| Std. Deviation | 1.8395 | 1.47382 | 1.76742 | 1.18694 |
| % Of total sum | 49.8% | 49.8% | 50.0% | 49.2% |
| Total mean | 3.8983 | 17.5624 | 12.8539 | 4.7081 |
| N | 258 | 258 | 258 | 258 |
| Std. Deviation | 1.8279 | 1.42354 | 1.65106 | 1.19463 |
| % Of total sum | 100.0% | 100.0% | 100.0% | 100.0% |

**Table 2: Gender distribution (n=258)**

| Gender | Group-A (n=129) | | Group-B (n=129) | |
|---|---|---|---|---|
| | No. of patients | Percentage | No. of patients | Percentage |
| Male | 69 | 53.5 | 70 | 54.3 |
| Female | 60 | 46.5 | 59 | 45.7 |
| Total | 129 | 100 | 129 | 100 |

## Discussion

Our aim in doing this study was to identify a technique to treat jaundiced babies in a way that would be more acceptable to parents and lessen the workload for hospital staff. In this study, we contrasted continuous and intermittent phototherapy delivery methods for the jaundiced neonates.[10]

The difference between groups A and B in terms of gender was statistically not significant. There was no statistically significant difference in the mean decrease of serum bilirubin between the two groups.

For both groups A and B, there was a statistically insignificant difference in the mean age at admission, mean baseline bilirubin, mean follow-up bilirubin, and mean decrease in serum bilirubin. (Reference Table 1). In that there was a statistically insignificant difference in the efficiency (mean drop in serum bilirubin) of both forms of phototherapy, our study's results were comparable to those of Niknafs et al. While we used phototherapy for a longer peri-

od of time than the previously mentioned study two hours on and thirty minutes off for continuous, and one hour on and one hour off for intermittent we did so for a longer duration two hours on and twenty minutes off for continuous, and one hour on and thirty minutes off for intermittent group.

The mean serum bilirubin levels in their study were 16.60 mg/dl±1.67 for continuous and 16.33 mg/dl±1.46 for intermittent groups; at 36 hours, the mean bilirubin levels were 9.17 mg/dl±1.83 for continuous and 9.02±1.94 for intermittent groups; in our study, however, the mean bilirubin levels were 17.64 mg/dl±1.37 for continuous and 17.48 mg/dl±1.47 for intermittent group prior to the start of phototherapy, and the mean bilirubin levels at 36 hours were 12.86 mg/dl±1.53 for continuous and 12.85 mg/dl±1.76 for intermittent groups. Stated differently, our study showed a significantly lower mean decrease in serum bilirubin than did theirs. This can be the result of different equipment.[9]

We used an hour of phototherapy in the intermittent phototherapy group and took 30 minutes off because we believe that thirty minutes is enough for a baby to be fed, cleaned, and given other necessary interventions. Because this was the first local effort, we avoided short on and long off periods and did not take the chance that the neonate's recovery from jaundice would be delayed. Now that the outcomes are consistent, we can support longer-term, more in-depth research projects.

## Conclusion

It was found that both intermittent and continuous phototherapies worked just as well.

In neonatal care units, intermittent phototherapy can be routinely used in place of continuous phototherapy due to its extra benefits; however, large-scale RCTs are required to confirm this.

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