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A comparative study of continuous versus intermittent phototherapy in the neonatal jaundice treatment

Sajid Shamim
Assistant Professor Paediatric Medicine Frontier Medical College, Abbottabad Pakistan

Muhammad Qasim Khan
Associate Professor Paeds, Bacha Khan Medical College, Mardan Pakistan
Corresponding author email*:* qasimkhan.dr.02@gmail.com

Waseem Pasha Yousaf
Assistant Professor of Paediatrics, CMH Kharian Medical College (CKMC), Kharian Pakistan

Alia Halim
Assistant Professor, Neonatologist /Pediatrician, Fazaia Medical College, PAF Hospital, Islamabad Pakistan

Syeda Tahira Batool
Senior Registrar Paeds Medicine, Divisional Head Quarter Teaching Hospital, Mirpur AJK

Sadaf Haroon
Assistant Professor Pediatrics, Dr Sadaf Specialized Hospital, Islamabad

***Abstract*---**Aim: The goal of this study is the comparison of the mean reduction in serum bilirubin after intermittent and continuous phototherapy for neonatal jaundice treatment. Study Design: A randomized controlled study. Place and Duration: In the Pediatric department of Mardan Medical Complex (MMC), Mardan for one-year duration from July 2021 to June 2022. Methodology: Total 200 children were registered after meeting the exclusion and inclusion criteria to compare the reduction in serum bilirubin following intermittent/ continuous phototherapy for neonatal jaundice treatment. There were 100 children in both Group A and B. The continuous phototherapy was given in Group A children while intermittent phototherapy was given in group B. The children in Group A were given continuous phototherapy (2 hrs with 20 mints

break), and intermittent phototherapy was given in group B children (1 hr therapy and 30 Mints break). Results: There were 200 patients in our study. 3.80 ± 1.80 (p = 0.90) days was the patients mean age, 16.56 mg / dL ± 1.39 (p = 0.35) was the mean baseline bilirubin and after follow-up; the mean bilirubin was 13.05 mg / dl ± 1.59 (p = 0.90), and the mean variation between follow-up and the mean bilirubin was 4.8 mg / dl ± 1.20 (p = 0.30). The mean age difference at hospitalization, mean baseline bilirubin, follow-up serum bilirubin and mean reduction in serum bilirubin for Groups A and B were not statistically significant. Conclusion: The continuous and intermittent phototherapies have been institute to be similarly operational. Due to its extra advantage, intermittent phototherapy may be used as a routine technique in neonatal units rather than continuous phototherapy.

***Keywords*---**phototherapy, neonatal jaundice, intermittent phototherapy, continuous phototherapy.

Introduction

The yellow discoloration of the sclera and skin is called Jaundice caused by a build-up of bilirubin in the mucous membranes and skin[1-2]. It is the most common clinical disorder necessitating medicinal care in new-borns[3-4]. It is seen up to 80% of premature and 60% of full-term babies. In our states, 39.7 babies are affected by neonatal jaundice per 1,000 live births[5]. The end product of haemoprotein catabolism is unconjugated bilirubin and high levels are potent neurotoxic substances[6]. Whatever the reason of jaundice, the goal of treatment is to avoid neurotoxicity from bilirubin in unconjugated form. The first line management of neonatal jaundice is phototherapy[7-8]. It works by conversion of bilirubin in unconjugated form into more polar stereoisomers that are easily excreted in the urine and bile and less neurotoxic[9]. The phototherapy effectiveness be contingent on the energy of light released in the operative wavelength range, the distance between the source of light and skin and the surface to which the child is exposed. Photo-isomerization is a fast process, one analysis revealed that a substantial number of 15E, 4Z photo isomers are formed within fifteen minutes[10]. Phototherapy can be used continuously as well as intermittently[11]. The study comparing intermittent and continuous phototherapy did not show significant differences in the effectiveness of intermittent and continuous phototherapy.

Most facilities use it continuous phototherapy, but more acceptable and easier one is intermittent. It is better for feeding new-borns, pleasing for parents, easy for hospital staff and encourages mother-infant bonding. In addition, few other advanced procedures, such as mom kangaroo care and infant massage are well practiced in intermittent phototherapy[12]. The goal of this study is the comparison of the mean reduction in serum bilirubin after intermittent and continuous phototherapy for neonatal jaundice treatment.

Methodology

This randomized, controlled study was held in the Pediatric department of Mardan Medical Complex (MMC), Mardan for one-year duration from July 2021 to June 2022. Total 200 children were registered after meeting the exclusion and inclusion criteria to compare the reduction in serum bilirubin following intermittent/ continuous phototherapy for neonatal jaundice treatment. There were 100 children in both Group A and B. The continuous phototherapy was given in Group A children while intermittent phototherapy was given in group B. The indirect serum bilirubin levels above 12 mg / dL in term new-borns called as neonatal jaundice as evaluated in a laboratory. The on and off schedule for administering phototherapy is called as Intermittent phototherapy. The selection criteria were aged 24hrs-10days, full-term neonates (≥ 37 weeks), 12 to 20mg/dl of serum indirect bilirubin, APGAR score > 6 at five-mints and exclusion criteria were ICU admitted patientsi.e. endotracheal intubation, peritoneal dialysis and on ventilator, children with significant birth defects such as skeletal, cardiac, dysmorphism, renal and seizures, refusal to feed, sepsis, positive blood culture, platelet count <50,000 Informed consent was obtained from the parents (father / mother, respectively) of infants who enrolled in the study and met the inclusion criteria. The phototherapy light height (distance between the source of light and children) remained same in groups A and group B. After 36 hours, the bilirubin concentration was evaluated. The children in Group A were given continuous phototherapy (2 hrs with 20 mints break), and intermittent phototherapy was given in group B children (1 hr therapy and 30 mints break). The researcher observed the switching on and off times of the phototherapy. Blood samples were collected and sent to the hospital laboratories for serum levels of bilirubin to be tested (before phototherapy, every 8 hours and every 36 hours) and the results were documented on the proforma. SPSS 21.0 was applied for data analysis. Quantitative variables like serum bilirubin at the beginning of phototherapy and at 36 hours, children age is accessible as mean ± SD. The genders taken as the qualitative variable are accessible as frequency and percentages. The serum bilirubin mean decrease was compared between the two groups with t-test and a p value of ≤0.05 was measured statistically significant.

Results

There were 200 patients in our study. 3.80 ± 1.80 (p = 0.90) days was the patients mean age, 16.56 mg / dL ± 1.39 (p = 0.35) was the mean baseline bilirubin and after follow-up; the mean bilirubin was 13.05 mg / dl ± 1.59 (p = 0.90), and the mean variation between follow-up and the mean bilirubin was 4.8 mg / dl ± 1.20 (p = 0.30).

Table 1 shows the phototherapy type given, patients' age, baseline and follow-up bilirubin and their difference

Parameters	Group-A (N=100)	Group-B (N=100)
Mean age on admission (days)	3.88±1.82	3.80±1.78
Mean baseline bilirubin (mg/dl)	16.76±1.38	16.36±1.40
Mean follow-up bilirubin (mg/dl)	13.2±1.56	12.9±1.62
mean difference between the baseline and follow-	4.82±1.3	4.78±1.1

up bilirubin (mg/dl)		

For infants in group A given continuous phototherapy, 3.90±1.80 days (p=0.90) was the mean age at hospitalization, 17.59 ±1.40mg/dl (p=0.35) was the mean baseline bilirubin and 12.70 ±1.52 mg/dl (p=0.90) was the follow-up serum bilirubin with the mean variation between follow-up and baseline bilirubin was 4.89 ± 1.20mg / dL (p = 0.33). For infants in group B, the mean variation between follow-up and baseline bilirubin was 4.60 ±1.16 mg / dL (p = 0.31). For infants in group B; mean age at hospitalization was 3.90 ± 1.84 (p = 0.91) in the children received intermittent phototherapy, 17.50 ± 1.51 mg / dL (p = 0.35) was the mean baseline bilirubin and 12.90 ±1.8mg/dl (p=0.92) was the mean bilirubin at follow-up.

Table 2 shows the gender-wise distribution

Gender	Group A(n=100)		Group B(n=100)	
	Total cases	%	Total cases	%
Male	60	60	70	70
Female	40	40	30	30
Total	100	100	100	100

Discussion

This study was planned to find a way to reduce the hospital staff burden and provide parents with a suitable treatment for children with jaundice[13-14]. In this analysis, 2 types of phototherapies were compared, continuous and intermittent, with neonates with jaundice. It also helps to foster the bond between mother and baby in a gainful way. In Pakistan; No study related to phototherapy comparison has been executed and this analysis will make available the baseline statistics for our setting[15-16]. Both groups have no statistically significant age difference and the serum bilirubin mean difference of reduction was not statistically significant in both groups[17-18]. The mean age difference at hospitalization, mean follow-up bilirubin, mean baseline bilirubin and mean reduction in serum bilirubin for A and B Groups were not significant statistically[19]. This study results comparable to those of Niknafs et al with no statistically substantial change in efficacy (mean serum bilirubin reduction) in both phototherapy types[20]. Compared to the above-mentioned study, although we used long-term phototherapy (2 hours 20 minutes for the continuous group, 1 hour and 30 mints rest for the intermittent group) in comparison to the aforementioned study (2 hours rest) and 1 hour phototherapy for an intermittent group). In their study, 16.60 mg / dL ± 1.67 was the mean bilirubin before start of phototherapy in the continuous group while intermittent group has 16.33 mg / dL ± 1.46 mean serum bilirubin and 9.17 mg ±1.82 was the mean bilirubin at 36 hours in the continuous group and 9.01 ± 1.89 for the intermittent group[21-22]. So, the mean serum bilirubin reduction in our study was much lesser than above mentioned study. This may be due to apparatus difference[23]. In the group of intermittent phototherapies, we use 1 hour of phototherapy and observe 30 minutes of rest, as we believe 30 minutes is enough to wash, feed the baby and, if necessary, other useful interventions[24]. We avoided short ignition periods and long rest periods as this was the first local effort and

we were not in danger of slowly recovering from jaundice. Now that the outcomes are the similar, we can inspire larger studies with more off-time.

Conclusion

The continuous and intermittent phototherapies have been institute to be similarly operational. Due to its extra advantage, intermittent phototherapy may be used as a routine technique in neonatal units rather than continuous phototherapy; however, this has to be approved by the RCT on a large scale.

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