COMPARISON OF MEAN REDUCTION IN SERUM BILIRUBIN BY SINGLE PHOTOTHERAPY UNIT WITHOUT & WITH WHITE PLASTIC COVER AROUND THE PHOTOTHERAPY UNIT IN FULL TERM JAUNDICED NEONATES

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ABSTRACT

Objectives: comparison of mean reduction in serum bilirubin by single phototherapy unit vs single phototherapy with white plastic cover around the unit in full term jaundiced neonates.

Materials and Methods: This study was conducted in Special Care Baby Unit Hayatabad Medical Complex from January 2016 to December 2016.Through consecutive(non probability) sampling ,100 full term neonates admitted for hyperblirubenemiawere randomly assigned by lottery method to group A(where single phototherapy unit alone) and B(where single phototherapy unit with white sheet around unit used).

Results: Our study shows that in Group A (standard phototherapy without cover around the unit), mean age was 5 days with standard deviation ± 1.62. Where as in Group B (standard phototherapy with white plastic cover around the phototherapy unit), mean age was 6 days with standard deviation ± 2.34. In Group A, 64% neonates were male and 36%neonatas were female. Where as in Group B, 60% neonates were male and 40%neonatas were female. At admission in Group Aneonates, mean serum bilirubin was 19.8 mg/dl with standard deviation ± 1.1, where as in Group B, mean serum bilirubin was 19.5 mg/dl with standard deviation ±1.3. After phototherapy, mean serum bilirubin in group A was 12 mg/dl with standard deviation ±2.0, where as in Group B, mean serum bilirubin was 14 mg/dl with standard deviation ± 2.87.

Conclusion: Our study concludes that using white plastic cover around the phototherapy unit increases the effects of phototherapy in reducing bilirubin level of serum and decreases duration of neonate's hospitalization, without increasing phototherapy side effects.

Key Words: Serum bilirubin level, phototherapy, full term neonate, jaundice.

INTRODUCTION

Hyperbilirubinemia resulting in clinical jaundice is a common problem among neonates. Hyperbilirubinemia affects as much as 60% of term neonates and 80% of preterm neonates in the first week of life. Hyperbilirubinemia are usually physiological and do not have serious consequences. High levels of indirect bilirubin can lead to neurotoxicity resulting in neurodevelopmental abnormalities such as hearing loss, athetosis, and rarely, intellectual deficits. Pathological jaundice occurs in the first 24 hours of life and merit investigations to know the underlying pathological cause[1].

Information about the incidence of neonatal jaundice is not available from developing countries where the vast majority of births occur at home. Most data is from tertiary care nurseries with no population denominator. A recent study from a neonatal unit in Karachi reported that neonatal jaundice accounted for 13.5% of all admissions, placing it third on the list of causes requiring admissions for neonates[2].

Indirect hyperbilirubenemia is effectively treated with phototherapy. Three major variables which affect the efficacy of phototherapy include: the wavelength of light (420 to 480mm), lamp energy output (irradiance), and distance between neonate and lamp upto 40 cm. multiple phototherapy units are sometimes used to increase the light intensity and thus improve the efficacy of phototherapy.[3] However, light intensity and the area of light-exposed skin can also be increased through the use of reflecting surfaces (eg, white curtains hung from the sides of the phototherapy unit).[4]

Three, non-randomisedstudies has thus far compared conventional single phototherapy with single phototherapy augmented with low-cost reflecting surfaces in the phototherapy units[5,7]. In a study done in Iran recently, total serum bilirubin in covered group, during the first 48 hours of treatment, declined significantly than in control group (P. value=0.003). The cover

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around the phototherapy unit had a positive impact in reducing duration of jaundice (P. value <0.0001) and duration of hospitalization (P. value <0.0001)[6].The purpose of this study was to compare the efficacy of single phototherapy without white covers with that of single phototherapy with white covers hanging from the sides.

MATERIALS AND METHODS

This study was conducted in Special Care Baby Unit ,department of pediatrics Hayatabad Medical Complex from January 2016 to December 2016. Through consecutive(non probability) sampling,100 full term neonates admitted for hyperbilirubenemia were randomly assigned by lottery method to group A(where single phototherapy unit alone) and B(where single phototherapy unit with white plastic cover around unit used). The covers were made of white shiny plastic with thickness of 2 mm, length of 66, width of 36 and height of 45 cm which would cover three sides of the unit; one side was uncovered for observing the newborn or performing procedures. The distance between the neonate and the phototherapy lamps was approximately 40 cm. Inclusion criteria were all jaundiced full term neonates(>37 weeks), age >48 hrs upto 14 days, serum billirubin (SBR) levels 15-20 mg/dl, birth weight >2500 grams and both sex. Exclusion criteria were hyper bilirubinemia requiring exchange transfusion, Rh hemolytic disease, sepsis, birth weight <2500 grams, age > two weeks. Approval of the study was obtained by institutional research and ethical committee before starting the project .The purpose and benefits of the study were explained to the parents of the neonates. They were told that all the information would be kept confidential and that study was designed purely for data review and publication purpose. A written informed consent obtained.

Patient demographic characteristics were noted including name, age, sex and address .All the information were extracted from parents in full privacy. The decision of initiation and discontinuation of phototherapy was based on 2004 American Academy of Paediatrics[8] guidelines for management of hyperbilirubenemia in term newborns.

For all neonates under study, before starting phototherapy, necessary tests including determining blood group of mother and neonate, peripheral blood smear, reticulocyte count, direct and indirect bilirubin estimation, direct Coombs test and measuring glucose-6-phosphate dehydrogenize enzyme level were ordered. After enrolment, the total serum bilirubin was measured every 12 hours and whenever the serum bilirubin level reached 12.5mg/dl or less, the neonates were discharged from the hospital.

RESULTS

This study was conducted in Department of Pediatrics SCBU, Hayatabad Medical Complex, and

Table No 1. Age Distribution (n=100)

AGE	GROUP A	GROUP B
2-5 days	15(30%)	17(34%)
6-10 days	24(48%)	23(46%)
11-14 days	11(22%)	10(20%)
Total	50 (100%)	50 (100%)
Mean and SD	5 days ± 1.62	6 days ± 2.34

Chi square test was applied in which P value was 0.001
Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Table No 2. Gender Distribution (n=100)

GENDER	GROUP A	GROUP B
Male	32(64%)	30(60%)
Female	18(36%)	20(40%)
Total	50 (100%)	50 (100%)

Chi square test was applied in which P value was 0.002
Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Table No 3. Serum Billirubin (Sbr) Level At Admission (n=100)

SERUM BILLIRUBIN	GROUP A	GROUP B
15-18 mg/dl	16(32%)	17(34%)
18-21 mg/dl	34(68%)	33(66%)
Total	50 (100%)	50 (100%)
Mean and SD	19.8 ±1.1	19.5 ± 1.3

Chi square test was applied in which P value was 0.005
Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Table No 4. Serum Billirubin (Sbr) Level After (48 Hours) Phototherapy (n=100)

SERUM BILLIRUBIN	GROUP A	GROUP B
11- 15 mg/dl	29(58%)	34(68%)
15-18 mg/dl	21(42%)	16(32%)
Total	50 (100%)	50 (100%)
Mean and SD	14 ± 2.87	12 ± 2.0

Chi square test was applied in which P value was 0.003
T test was applied in which P value was 0.003
Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Table No 5. Stratification Of Serum Billirubin (Sbr) Level After 24 Hours With Age

AGE	SBR (mg/dl)	GROUP A	GROUP B	P value
2-5 days	11- 15	15	17	0.000
	15-18	0	0	
Total		15	17	
6-10 days	11- 15	14	17	0.002
	15-18	10	6	
Total		24	23	0.000
11-14 days	11- 15	0	0	
	15-18	11	10	
Total		11	10	

Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Table No 6. Stratification Of Serum Billirubin (Sbr) Level After 24 Hours With Gender

GENDER	SBR (mg/dl)	GROUP A	GROUP B	P value
Male	11- 15	19	20	0.002
	15-18	13	10	
Total		32	30	
Female	11- 15	10	14	0.002
	15-18	8	6	
Total		18	20	

Group A: standard phototherapy without cover around the unit
Group B: standard phototherapy with white plastic cover around the phototherapy unit.

Peshawar in which a total of 100 neonates (50 in each group) were included for comparison of mean reduction in serum bilirubin by single phototherapy without white plastic cover around the phototherapy unit vs. single phototherapy with white plastic cover around in full term jaundiced neonates and the results were analyzed as below.

Age distribution among two groups was analyzed as in Group A (standard phototherapy without cover around the unit), 15(30%) neonates were in age range 2-5 days, 24(48%) neonates were in age range 6-10 days and 11(22%) neonates were in age range 11-14 days. Mean age was 5 days with standard deviation ± 1.62. Where as in Group B (standard phototherapy with white plastic cover around the phototherapy unit), 17(34%) neonates were in age range 1-5 days, 23(46%) neonates were in age range 6-10 days and 10(20%) neonates were in age range 11-14 days. Mean age was 6 days with standard deviation ± 2.34. (As shown in table No 1)

Gender distribution among two groups was analyzed as in Group A, 32(64%) neonates were male and 18(36%) neonates were female. Where as in Group B, 30(60%) neonates were male and 20(40%) neonates were female (as shown in table No 2)

Serum bilirubin (SBR) levels at admission among two groups were analyzed as in Group A, 16(32%) neonates had serum billirubin level ranged 15-18 mg/dl, 34(68%) neonates had serum billirubin level ranged 18-21mg/dl. Mean serum bilirubin was 19.8 mg/dl with standard deviation ± 1.1. Where as in Group B, 17(34%) neonates had serum billirubin level ranged 15-18 mg/dl, 33(66%) neonates had serum billirubin level ranged 18-21 mg/dl. Mean serum bilirubin was 19.5 mg/dl with standard deviation ±1.3. (as shown in table No 3)

Serum billirubin (SBR) level after (24 hours) phototherapy among two groups was analyzed as in Group A, 29(58%) neonates had serum billirubin level ranged 11-15 mg/dl, 21(42%) neonates had serum billirubin level ranged 15-18mg/dl. Mean serum bilirubin was 14 mg/dl with standard deviation ± 2.87. Where as in Group B, 34(68%) neonates had serum billirubin level ranged 11-15 mg/dl, 16(32%) neonates had serum billirubin level ranged 15-18 mg/dl. Mean serum bilirubin was 12 mg/dl with standard deviation ±2.0. (as shown in table No 4)

Stratification of serum billirubin (SBR) level after (24 hours) phototherapy with age, gender is given in table no 5, 6

DISCUSSION

Our study shows that in Group A (standard phototherapy without cover around the unit), mean age was 5 days with standard deviation ± 1.62. Where as in Group B (standard phototherapy with white plastic cover around the phototherapy unit), mean age was 6 days with standard deviation ± 2.34. In Group A, (64%) neonates were male and (36%) neonates were female. Where as in Group B, (60%) neonates were male and (40%) neonates were female. At admission in Group A, mean serum bilirubin was 19.8mg/dl with SD ±1.1 and after phototherapy, mean serum billirubin was 14 mg/dl with standard deviation ± 2.87. On the other hand at admission in group B, mean serum billirubin was 19.5mg/dl with SD ±1.3 and after phototherapy, mean serum bilirubin was 12 mg/dl with standard deviation ±2.0.

Similar results were observed by BabaeiH et al[6]in Control group (standard phototherapy without cover around the unit), mean age was 4 days with standard deviation ± 2.33. Where as in Covered group (standard phototherapy with white plastic cover around the phototherapy unit), mean age was 5 days with standard deviation ± 3.27. In Control group, 32neonatas were male and 59 neonates were female. Where as in Covered group, 32neonatas were male and 59 neonates were female. In Control group, mean serum bilirubin was 13.3 mg/dl with standard deviation ± 2.10. Where as in Covered group, mean serum bilirubin was 12 mg/dl with standard deviation ±1.9. Total serum bilirubin in covered group, during the first 48 hours of treatment, declined significantly than in control group (P. value=0.003). The mean reduction of SBR of group with white sheets (covered group) was 12 and mean reduction of SBR of group without white sheet (controlled group) was 13.3atend of 48 hours of phototherapy.

Similar results were found in other studies as KappasA et al[9] had explained in his study as the plastic cover around the phototherapy unit can accelerate decreasing serum level of bilirubin in neonates, and decreases hospital stay, without increasing phototherapy complications.

In a study performed by Djokomulijanto et al[5] to evaluate the use of white curtains around the beds of infants treated by phototherapy, 97 newborns were studied. Case group had 50 and control group had 47 neonates. The results showed that the rate of bilirubin level decline in case group (25.24 micromole/l) was significantly greater than control group (24.27 micromole/l) ($p<0.001$). Also duration of phototherapy in the case group was dramatically shorter than the control group (12 hours). Additionally, in the case group no increase in the rate of complications of phototherapy was observed than the control group.

In another study, the neonates with hemolysis were excluded because their serum bilirubin rises rapidly and the potential of need for intensive phototherapy or blood exchange is high. In another study, 84 icteric term infants without hemolysis were evaluated; they were divided into two groups, the first group included 42 infants for which white plastic cover with smooth surface was used around the phototherapy unit to increase the effect of phototherapy and in the second group (42 neonates) phototherapy without cover was used. Birth weight, gestational age and initial bilirubin level in both groups were the same. In this study, unlike our study, no dramatic difference was found in the phototherapy duration between the two groups[7], perhaps because of using a cover with low reflection coefficient.

In Hansen' et al [10] study, using white pads around the neonate's bed during phototherapy resulted in Irradiance increase and thus shortened the duration of phototherapy.

Recently it has been shown that the use of LED (Light Emitting Diode) lamps in the phototherapy units are as effective as fluorescent lamps in the treatment of Jaundice, while produce less heat.[11] Also, a study conducted by Salehzadeh et al [12] showed that the use of mirror behind phototherapy lamps can enhance the effectiveness of phototherapy without increasing the risk of hyperthermia.

As shown by the above studies and our study results, it seems that using a white plastic cover around the phototherapy unit can enhance the phototherapy effect in reducing serum bilirubin level, as it increases the reflection of the light on the baby's body surface. This method can decrease duration of treatment in neonates without increasing the side effects of phototherapy.

CONCLUSION

Our study concludes that using white plastic cover around the phototherapy unit increases the effects of phototherapy in reducing bilirubin level of serum and decreases duration of neonates' hospitalization, without increasing phototherapy side effects.

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