

## Original Article

# Comparison of single versus double phototherapy for neonatal hyperbilirubinaemia in term and preterm infants

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## ABSTRACT

**Aim:** The aim of the study was to compare the effectiveness of double phototherapy versus conventional single phototherapy in the treatment of neonatal hyperbilirubinaemia in term and preterm infants.

**Materials and Methods:** Newborns with hyperbilirubinaemia were subjected to single or double phototherapy by paediatrician. Total bilirubin levels were recorded before and after phototherapy and compared

**Results:** The mean decrease of total bilirubin is higher in infants who received double phototherapy than single phototherapy. The average decrease of total bilirubin after phototherapy is also higher in term than preterm infants.

**Conclusion:** The double phototherapy is more effective than single phototherapy in the treatment of neonatal hyperbilirubinaemia both in term and preterm infants.

**KEYWORDS:** Phototherapy, Neonatal Hyperbilirubinaemia, Preterm & Term.

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## INTRODUCTION

Hyperbilirubinaemia is one of the most common problems in term newborns and the phototherapy is the most widespread treatment for lowering bilirubin concentration in neonates [1]. The efficacy of phototherapy depends mainly on the intensity and wavelength of light and the proportion of body surface area exposed to light. A single phototherapy is the most commonly

used and when bilirubin levels approach the threshold for exchange transfusion, intensive phototherapy is indicated method [2]. For this purpose, it increases the body surface area of the newborn exposed to light and the intensity of phototherapy with the use of side panels and reflecting objects mattress optical fibre. Among these materials a second side panel also called double phototherapy is often used [3]. Several researchers concluded that double phototherapy

was more effective than single phototherapy for treatment of neonatal hyperbilirubinaemia [4, 5, 6, 7]. However Silva et.al concluded that double-surface was not more effective than single-surface phototherapy in the treatment of nonhemolytic hyperbilirubinemia in term newborns [3]. The aim of this study was to evaluate the effectiveness of single and double phototherapy in reducing bilirubin levels in new-born term and preterm infants with hyperbilirubinaemia.

## MATERIALS AND METHODS

A Prospective randomized controlled trial study conducted in tertiary hospitals of south India during March 2012 to January 2014. Total 232 infants (terms-190; preterm-42) who met phototherapy criteria were included for the study. Study subjects were randomized in to two groups. Group I comprises 120 infants (term-100; 20-preterm) who received conventional single phototherapy and group II with 112 infants (term-90; preterm-22) who received double phototherapy. Serum total bilirubin levels were measured in autoanalyzer based on the principle that a stabilized diazonium salt, 3-5-dichlorophenyldiazonium tetrafluoroborate reacts with conjugated bilirubin directly and with unconjugated bilirubin in the presence of an accelerator to form azobilirubin and the absorbance at 540nm is proportional to the total bilirubin concentration. Appropriate ethical clearance was obtained from institutional ethical committee. Data were analysed by using Statistical Package for Social Science (SPSS) software package and 't' test was done to compare the data. Results were expressed as mean±SD. The difference were considered significant at  $p < 0.05$ .

## RESULTS

The mean serum total bilirubin for 42 preterm infants was  $18.78 \pm 3.22$  and mean serum total bilirubin for 190 preterm infants was  $20.98 \pm 4.46$  (Table 1). The mean decrease of serum total bilirubin/day was greater for double phototherapy (preterm- $3.12 \pm 1.24$ ; term- $4.92 \pm 2.31$ ) than single phototherapy (preterm- $2.75 \pm 1.06$ ; term- $3.21 \pm 2.11$ ) in both preterm and term infants. The mean decrease of serum total

bilirubin/day for both the groups were statistically significant.

**Table 1:** Total serum bilirubin in term and preterm infants.

GROUP	'n' No. of infants	Mean Total bilirubin level (mg/dl)
PRETERM	42	$18.78 \pm 3.22$
TERM	190	$20.98 \pm 4.46$

**Table 2:** Mean decrease of serum total bilirubin per day in single and double phototherapy in study groups.

GROUP	PHOTOTHERAPY	Mean decrease of serum total bilirubin/day	'p' value
PRETERM (n=42)	Single (20)	$2.75 \pm 1.06$	0.02
	Double (22)	$3.12 \pm 1.24$	0.01
TERM (n=190)	Single (100)	$3.21 \pm 2.11$	0.01
	Double (90)	$4.92 \pm 2.31$	<0.01

## DISCUSSION

Phototherapy is the primary treatment in neonates with unconjugated hyperbilirubinemia if bilirubin levels are judged to be too high, then phototherapy with UV light is used to convert it to a water soluble, non-toxic form. Management of jaundice is directed towards reducing the level of bilirubin and preventing CNS toxicity. Bilirubin in the skin absorbs light energy, which by photo-isomerization converts the toxic native unconjugated 4Z, 15Z-bilirubin into the unconjugated configurational isomer 4Z, 15E-bilirubin. The latter is the product of a reversible reaction and is excreted in bile without any need for conjugation.

Bilirubin elimination depends on the rates of formation as well as the rates of clearance of the photoproducts. Photo isomerization occurs rapidly during phototherapy, and isomers appear in the blood long before the level of plasma bilirubin begins to decline. In our study higher reduction of serum total bilirubin in double phototherapy in both term and preterm infants observed when compared to single phototherapy. However both single as well as double phototherapy were effective and also statistically significant. Double phototherapy may be useful when it is necessary to reduce an elevated serum bilirubin level as rapidly as possible or when the bilirubin level is rising with

single phototherapy [8]. In phototherapy treatment of term newborns with significant hyperbilirubinemia, double phototherapy provided more rapid and effective bilirubin reduction than conventional phototherapy alone due to higher spectral irradiance and larger body surface area exposed to phototherapy [9]. Similar to this study other investigators confirmed that double surface phototherapy is more efficient than single surface phototherapy in term as well as in preterm infants [4-7, 10]. The use of phototherapy has decreased the need for exchange transfusion in term and preterm infants with haemolytic and nonhemolytic jaundice [11] Intensive phototherapy may eliminate the need for exchange transfusion [12].

## CONCLUSION

Our study concludes that double phototherapy can be more effective when compared with single phototherapy in both term and preterm infants for the treatment of neonatal hyperbilirubinaemia. This study also suggests that serum total bilirubin decrease rate after phototherapy is greater in term infants than preterm infants.

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