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A Study to Assess the Jaundice and Physiological Outcome in Neonates Receiving Phototherapy with White Sling Application around the Cradle in Selected Neonatal Intensive Care Units of Mangalore

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Abstract: *Though phototherapy is extremely effective in bringing down the bilirubin levels in neonatal jaundice reflective effect of the white sling material around the phototherapy would enhance the reduction of jaundice. The aim of the study is to assess the effectiveness of white sling application around the phototherapy in the reduction of jaundice and physiological outcome in the healthy full term neonates.A quasi-experimental time series design was used and 40 neonates subjected to phototherapy were randomly assigned by lottery method to experimental (white sling around phototherapy) and control group (without white sling). The pre-intervention Mean serum bilirubin in experimental (17.20+2.072), and in control group (16.39+1.928). After 8th and 24th hours of phototherapy in the experimental group was declined (3.085+1.03) (t=7.907,p<0.05) and (6.415+ 1.496 mg/dl,) (t=5.985,p< 0.05) while in the control group (1.1140 + .385) (t=7.907,p<0.05) and (3.750+ 1.314 mg/dl) (t=5.985,p< 0.05)respectively. The result shows a significant difference in the rate of reduction of serum bilirubin between the experimental and control group and it is one of the cost effective, non-invasive, non pharmacological management of neonates with non hemolytic jaundice.*

Keywords: *white sling application, physiological outcome, serum bilirubin, blanching of skin.*

I. Introduction

Hyperbilirubinemia is the commonest morbidity in the neonatal period and 5–10% of all newborns require intervention.[1,2] Neonatal jaundice is estimated to occur in the majority of term infants (60%) in the first week of life, and approximately 2% of infants reach total serum bilirubin (TSB) levels in excess of 20 mg/dL[3] Hyperbilirubinemia can lead to a severe complication known as kernicterous. It has high morbidity and survivors of this pathology can present serious problem, like coreoathetosis, deafness and mental impairment.[1,2] Treatment is primarily focused on decreasing the bilirubin level and Phototherapy is a common and primary treatment in neonatal jaundice.[4,5] Studies have assessed the optimal wavelength of phototherapy light, the importance of irradiance and spectral power, and the types of light source, including the use of single versus multiple light sources. Outcome measures have been duration of need for phototherapy or rate of reduction of serum bilirubin over a given period of time.[6]

The effectiveness of phototherapy is related to the area of skin exposed, the radiant energy, and the wavelength of the light and the duration of exposure. The fall in bilirubin level is proportionately greater in the skin than in serum. Therefore, the infant receiving phototherapy should have as much as possible, skin exposed to the lights. [7]

The neonate is totally dependent and the early period of bonding between the mother and neonate is important. The neonatal jaundice and phototherapy might keep them separate, leading in increased cost and anxiety among parents. Phototherapy with simple white curtains hung at the sides of a phototherapy unit is more effective than phototherapy without curtains. This may translate into potential cost reduction in two ways. Firstly shorten the duration of treatment while the second by shorting the length of hospitalization. This would also mean considerably less separation from the mother and less interruption of breast feeding.

A randomised control clinical trial was conducted in 2006 July in Malaysia, on the efficacy of phototherapy for neonatal jaundice to see if it has been increased by the use of low-cost white reflecting curtains in all term newborns with uncomplicated neonatal jaundice (experimental group n=50) compared with single phototherapy without curtains (control group n=47). The mean (standard deviation) decrease in total serum bilirubin levels after 4th hourof phototherapy was significantly (p<0.001) higher in the study group (27.62 (25.24) μmol/l) than in the control group (4.04 (24.27) μmol/l). [8]

Keeping the above facts in mind, the present study is intended to increase the rate of reduction in serum bilirubin and to decrease the duration of phototherapy and positive physiological outcome by applying a white sling around the phototherapy cradle this is a cost effective intervention. This may result in early reduction of serum bilirubin and thus early discharge, promote parent-infant bonding. It decrease parental anxiety, financial constrain and other complications of prolonged phototherapy.

II. Methodology

A quasi-experimental time series design was used to assess the effectiveness of white sling application around the phototherapy in the reduction of jaundice and physiological outcome in the healthy full term neonates. The subjects were selected by purposive sampling technique and were assigned to experimental and control group by using a lottery method. The subjects assigned to experimental group were placed under phototherapy with white sling application that is made up of white plastic sheet with reflecting inner surface which is hung around three sides of double surface phototherapy cradle and left open on one side for uninterrupted observation and care of the neonates. The control group was placed in under double surface phototherapy cradle. Both groups were assessed the status of jaundice at the initiation, 8^{th} and 24^{th} hour of phototherapy by Serum total bilirubin, skin blanching Checklist and physiological status by Neonatal outcome scale.

III. Results

The analysis of the data shows, the speed of bilirubin reduction was slow in control group, when compared to the experimental group. In the experimental group the serum bilirubin level at pre-intervention was severe (mean 17.20+2.072), moderate at 8^{th} hour (mean 14.11+2.009) and mild at 24^{th} hour (mean 10.78+1.608) (ANOVA=270.580)while in control group the serum bilirubin level at pre-intervention was severe (16.390+1.928) and at 8^{th} hour continue to be severe (mean 15.245+1.742) with mild reduction but only at 24^{th} hour it dropped to moderate level (mean 12.635+0.948)(ANOVA=141.246) The rate of reduction of serum bilirubin in the experimental group at pre-intervention to 8^{th} hour was greater (mean 3.085±1.030) compared to control group (1.140±0.386) ($t=7.907$, $p<0.05$); pre-intervention to 24^{th} hour in the experimental group was also greater (6.415±1.496) when compared to the control group (3.750±1.315) ($t=5.985$, $p<0.05$); 8^{th} hour to 24^{th} hour in the experimental group was also greater (3.330±1.125) when compared to the control group (2.610±1.124) ($t=2.025$, $p<0.05$).

IV. Figures And Tables

Table 1: ANOVA showing the effectiveness of white sling in the reduction of jaundice and improved physiological outcome of neonates in the experimental group

n = 20

Parameter	Time interval	Mean	SD	ANOVA (F)
Serum Bilirubin	Pre-intervention	17.200	2.072	270.580*
	8^{th} hour	14.110	2.009	
	24^{th} hour	10.780	1.6084	
Blanching of skin	Pre-intervention	4.50	0.607	337.460*
	8^{th} hour	3.60	0.681	
	24^{th} hour	1.95	0.394	
Physiological outcome	Pre-intervention	26.35	1.268	125.182*
	8^{th} hour	29.50	0.688	
	24^{th} hour	29.45	0.579	

Table value of ANOVA = 2.850 * Significant

Table 2: Significance of difference in the reduction of jaundice and physiological outcome between the experimental and control groups

n= 20 + 20

Parameter	Comparison	Group	Mean	SD	't' value
Serum bilirubin	Pre-intervention – 8^{th} hour	Experimental	3.085	1.030	7.907*
		Control	1.140	0.386	
	Pre-intervention – 24^{th} hour	Experimental	6.415	1.496	5.985*
		Control	3.750	1.315	
	8^{th} hour – 24^{th} hour	Experimental	3.330	1.125	2.025*
		Control	2.610	1.124	
Blanching skin	Pre-intervention – 8^{th} hour	Experimental	0.900	0.308	6.102*
		Control	0.200	0.410	
	Pre-intervention – 24^{th} hour	Experimental	2.550	0.510	6.216*
		Control	1.450	0.605	
	8^{th} hour – 24^{th} hour	Experimental	1.650	0.489	2.430*
		Control	1.250	0.550	
Physiological outcome	Pre-intervention – 8^{th} hour	Experimental	-3.150	1.182	2.029*
		Control	-2.350	1.309	
	Pre-intervention – 24^{th} hour	Experimental	-3.100	1.210	0.543
		Control	-2.900	1.119	
	8^{th} hour – 24^{th} hour	Experimental	0.050	0.510	2.009*
		Control	-0.550	1.234	

Table value $t_{38}=1.690$, $P \leq 0.05$ * Significant

V. Conclusion

White sling application around the phototherapy cradle had a greater reduction of jaundice and improved physiological outcome and all neonates could be discharged within 24 hours phototherapy treatment with greater fall in serum bilirubin level. Early parent-child bond could be build up as well as cost of treatment could be reduced without the evidence of adverse effects. The sample size was small and irradiance of phototherapy was not measured.

A similar study could be conducted with randomization and selecting an equally comparable larger sample.Over the last two decades there has been a constant endeavor, to develop ways to increase the efficacy of phototherapy and at the same time reduce the side effects. Hanging White curtains around the phototherapy is an easy, effective and safe method, which can be routinely practiced in the treatment of neonatal jaundice.

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