Effectiveness of Fiberoptic Phototherapy Compared to Conventional Phototherapy in Treating Hyperbilirubinemia Amongst Term Neonates: a Randomized Control Trial

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Abstract

Background

Neonatal jaundice is one of the most common problems in newborns. Effective treatment of jaundice requires therapeutic intervention with phototherapy (PT). Conventional phototherapy has been used for more than 50 years, but has been linked with adverse outcomes. Over recent years, several studies suggest fiberoptic phototherapy has been seen to be as effective as conventional phototherapy in preterm newborns with minimal adverse outcomes, however it was found to be less effective than conventional phototherapy in term neonates. These findings were attributed to the illuminated area and irradiance of the fiberoptic units used in previous studies. Our study aimed to compare the effectiveness of fiberoptic phototherapy unit with a larger illuminated area and higher irradiance to conventional phototherapy methods.

Methods

This was a randomized control trial conducted at Kilimanjaro Christian Medical Centre (KCMC). A total of 41 term neonates, less than 7 days of age with unconjugated hyperbilirubinemia were randomized. Thirteen (13) newborns were allocated to receive fiberoptic phototherapy, 13 for blue light conventional phototherapy and 15 for white light conventional phototherapy. Effectiveness was assessed by comparing the duration of phototherapy, bilirubin reduction rate and treatment side effects. The data was evaluated with the independent t-test.

Results

The mean overall bilirubin reduction rate (as %/h) was comparable in the fiberoptic phototherapy group (0.74%/h) and the blue light conventional phototherapy group (0.84%/h), with no statistically significant difference (*p*-value 0.124). However, white light conventional phototherapy had a significantly lower overall mean bilirubin reduction rate (0.29%/h) as compared to fiberoptic phototherapy (*p*-value < 0.001). The mean treatment duration of phototherapy was 69 h, 68 h and 90 h in the fiberoptic, blue light conventional and white light conventional phototherapy groups respectively. Side effects such as loose stool and skin rash were noted in some participants who received conventional phototherapy. No treatment side effects were noted in the fiberoptic phototherapy group.

Conclusion

The results confirm and quantify the benefits of increasing surface-area exposure and irradiance of the fiberoptic phototherapy unit. Fiberoptic phototherapy mitigates side effects caused by conventional phototherapy.

Trial registration:

The Pan African Clinical Trial Registry, PACTR202004723570110. Registered 22nd April 2020- Retrospectively registered, http://www.pactr.org/

Background

Globally an estimated 50% of term newborns develop hyperbilirubinemia (which may manifest as jaundice), typically 2–4 days after birth and about 25% of these babies will require phototherapy to avoid the effect of high serum unconjugated bilirubinaemia which can lead to bilirubin-induced neurologic dysfunction (BIND) which occurs when bilirubin crosses the blood-brain barrier and binds to brain tissue resulting in brain injury if not treated appropriately in a timely fashion (1–3).

Three interventions are used to reduce total serum bilirubin (TSB) levels for infants with or at risk of developing hyperbilirubinemia, which are promotion of enteral feeds, phototherapy, and exchange transfusion. Phototherapy is now the preferred method of treatment for neonatal hyperbilirubinemia by virtue of its non-invasive nature and its safety (4–6).

Phototherapy refers to the use of light of specific wavelengths and doses to convert lipophilic bilirubin molecules in the body into water soluble isomers that can be excreted by the body to reduce TSB. Currently, there are several forms of phototherapy: conventional, fiberoptic and LED used in the treatment of hyperbilirubinaemia (7). The effectiveness of a phototherapy unit is determined by several factors, which include distance of light source from patient, surface area covered, wavelength and the irradiance of the phototherapy unit (8).

Conventional and fiberoptic phototherapy has been proven to be equally effective in treatment of hyperbilirubinaemia among preterm neonates (9, 10). However, a Cochrane review reported the efficacy of fiberoptic phototherapy in a number of different clinical situations and patient populations, and found that fiberoptic phototherapy was less effective than conventional phototherapy at lowering serum bilirubin in term neonates (10). These findings were attributed to the low irradiance and the surface area illuminated by the mat of the fiberoptic phototherapy units used in previous studies (9, 11, 12).

Our study aimed to compare the fiberoptic phototherapy unit with a larger illuminated area and high irradiance to conventional phototherapy with regard to bilirubin reduction rate, side effects and duration of treatment among term neonates with unconjugated hyperbilirubinemia.

Methods

Study design, duration and study area

A parallel randomized control trial to test three treatment groups was conducted in the neonatal care unit (NCU) at the Kilimanjaro Christian Medical Centre (KCMC) in Northern Tanzania from January 2019 to

May 2019. The NCU has a bed capacity of 62 babies, with an average of 1:10 nurse to patient ratio per shift. The babies are nursed in locally made heated cots which use incandescent bulbs to heat them. In our neonatal care unit, conventional phototherapy is the only treatment modality used for unconjugated hyperbilirubinaemia.

Eligibility criteria

65 term neonates (>37 weeks of gestation), less than 7 days of age, admitted with jaundice, were identified by clinicians working in the neonatal unit and screened for eligibility. We included those with hemolytic and non-hemolytic unconjugated hyperbilirubinemia with a total bilirubin level that has reached phototherapy threshold values as per the American Academy of Pediatrics (AAP) nomogram which is a validated tool used for making decision regarding phototherapy in infants with unconjugated hyperbilirubinemia. Excluded from the study were: neonates receiving phenobarbitone; neonates with bilirubin levels that have reached exchange transfusion levels on the AAP nomogram; neonates with conjugated hyperbilirubinaemia; neonates who have already received phototherapy prior to enrollment and those whose parents refused to consent.

Sample size estimation

Consent was obtained from parents of eligible participants. In order to obtain our sample size, we used the 34μmol/L effect size in the three arms, with a level of significance of 5%, power of 85%. The minimal sample size in addition to non-response rate of 20% was 39. We included 41 term neonates who met the inclusion criteria.

Study variables and data collection method

A questionnaire was used to collect demographic data such as sex, gestation age at birth (determined according to the maternal history and Ballard's scoring system), mode of delivery, birth weight in kilograms, residents, age at enrollment in days, and type of feeding mode.

Participants were randomized, then allocated to intervention groups by the research assistants. Simple randomization was performed by drawing a paper from a container containing 45 folded papers: 15 marked 'FB' (Fiberoptic BiliBlanket), 15 marked 'B' (Bluelight PT) and 15 marked 'W' (White light PT). This was an open label trial whereby both the parent of the participants and the researchers knew which intervention the neonate was receiving.

Before phototherapy initiation, a clinical assessment was done on the neonate, and vitals were recorded. Laboratory characteristics such as total serum bilirubin and direct serum bilirubin were also recorded. Phototherapy was employed as per our standard nursery protocol and equipment. The neonate was nursed in an open cot wearing only a diaper which was folded to allow maximum skin exposure to phototherapy, and was turned every two hours from prone to supine positions.

The white light PT unit “Atom model PIT- 220 TL” (Atom Medical), consists of six white fluorescent bulbs (PHILIPS, TL-D 18W/64-765) and was placed 35 cm above the neonate with an illuminated cabinet of 66.5cm x34.5cm and a constant irradiance of 8 µW/cm2/nm. The blue light PT unit “Olympic Bili-Lite model 66” (Olympic Medical), consisted of four Olympic blue fluorescent bulbs placed 20cm above the neonate with an illuminated cabinet of 66cm x 27.9cm and a constant irradiance of 27 µW/cm2/nm. Eye pads were used for neneonate on conventional phototherapy to prevent damage to the retina. The BiliBlu LED fiberoptic phototherapy unit (Martand Medical Services) with body surface area of 25cm x 40cm was wrapped around the neonate with a constant setting of 34 W/cm^2/nm light irradiance. Irradiance of the phototherapy units was measured using the GE Healthcare BiliBlanket Light Meter II. Irradiance in all phototherapy units was measured from the skin surface of the neonate, 3 measurements were taken: one measurement centrally and two measurements at the two most extreme peripheries covered by the PT unit, subsequently an average irradiance was calculated for each phototherapy unit. Phototherapy was administered continuously except during minor procedures such as feeding, diapering, physical examination and capillary blood sampling.

Serum bilirubin reduction rate was assessed as the decline in the TSB levels for the duration of exposure to phototherapy, expressed as a percentage of decline per hour. This was monitored through daily total serum bilirubin levels. Treatment failure was defined as the need for additional phototherapy units (‘double phototherapy‘) determined by serial serum bilirubin response while on phototherapy, of which a rise in serum bilirubin level more than 9µmol /L per hour after phototherapy initiation was an indicator for double phototherapy. Phototherapy was stopped when serum bilirubin levels were 50mol/l below the phototherapy threshold value on the AAP nomogram. Treatment duration was then assessed as the duration of time of exposure to phototherapy in hours.

Blood samples were analyzed at the KCMC clinical laboratory. The Cobas Integra 400 Plus (Roche Company) bilirubin levels. The sample reached the laboratory within 15min of collection. A minimum of 1ml of blood was required. Care was taken to prevent exposure to light by placing sample in a dark blood transportation box.

Neonates were closely monitored for side effects of the treatments which included: decreased intestinal transit time: loose, greenish stools; hydration status: slow weight gain, assessed as the difference in daily body weight after starting PT, a difference of more than 5% body weight loss was considered as dehydrated; skin rashes and brownish discoloration of skin were assessed by a dermatologist. Participants were monitored throughout phototherapy for temperature, respiratory rate, heart rate, this was done 4 hourly. Weight was checked daily.

At enrollment, mothers were asked to express breast milk to quantify the milk production. When necessary, neonates were supplemented with infant formula milk to maintain the total daily feeds requirement. Neonates were fed every 3 hours in all PT groups. Those who were not maintaining adequate oral intake were complemented with IV fluids to maintain the total daily fluid requirement, considering the postnatal age, clinical and laboratory findings.

Research assistants recruited for the study were registered nurses working in the NCU. Research assistants enrolled the participants for the study. They were trained on how to randomize and assign participants to intervention. They were familiarized with the study protocol for PT, how to correctly place the PT unit, when to interrupt PT with clear documentation of duration of PT interruption, measurement of the body weight, axillary temperature, heart rate, respiratory rate. A Pilot study was conducted to familiarize the research assistants with the study.

Data analysis

Data was done using Statistical Package for Social Sciences (SPSS) version 23. The data was statistically evaluated with the independent t-test to compare means of bilirubin reduction rate and treatment duration. A *p*-value of 0.05 was regarded statistically significant.

Result

Participant flow

A total of 65 term neonates, less than 7 days of age were admitted with jaundiced between January 2019 to May 2019 and were assessed for eligibility. Of these, 24 were excluded; 21 because of bilirubin levels below the phototherapy threshold and 3 had bilirubin levels at the exchange transfusion threshold. 41 were randomized, and allocated to the three intervention groups. Thirteen (31.7%) were allocated to blue light conventional phototherapy, 15 (36.6%) were allocated to white light conventional phototherapy and 13 (31.7%) were allocated to fiberoptic phototherapy. These participants received intervention and were followed up until phototherapy was stopped. Final analysis was performed on 41 participants as per allocation to intervention, no participants discontinued the study. Figure 1

Baseline Characteristics

The majority of participants were male 25 (61.0%), 18 (43.9%) of the participants were residing in Moshi Municipality, and 36 (87.8%) were delivered through spontaneous vertex delivery. Exclusive breastfeeding was the most common mode of feeding 35 (85.4%). The majority i.e. 27 (65.9%) of the participants were aged 3 to 4 days at the time of enrolment. Table 1.

Baseline and Clinical characteristics : Comparison of the three treatment groups

There were no differences in baseline characteristics between the three groups at enrolment. The mean gestation age at birth was 39 weeks for the white light conventional and fiberoptic PT groups and 38 weeks for the blue light conventional PT group. The mean birth weight was 2.9 kg in the blue light PT group, 3.1 kg in the white light PT group and 3.3 kg in the fiberoptic PT group. The mean age at onset of jaundice was 3 days across all three groups of PT. The mean weight at enrolment and mean weight at the end of PT remained the same in all PT groups (2.7kg, 3.2kg and 2.9kg in the blue light, fibreoptic and white light conventional PT respectively). The mean axillary temperature during phototherapy was 37 °C across all the groups. The mean serum bilirubin levels at the start of PT were similar in all three groups

with the highest being 299.75 in the fiberoptic PT group and the lowest being 283.71 in the white light PT group. Table 2.

Total serum bilirubin reduction rate

Total Serum bilirubin reduction rate as a % per hr

The blue light conventional phototherapy the reduction rate (as %/hour) was 0.56, 0.73, 0.89 and 1.21 for each subsequent 24 hours. Whereas, the fiberoptic phototherapy bilirubin reduction rate (as %/hour) was 0.59, 0.61, 0.76 and 0.99 for each subsequent 24 hours. The white light phototherapy had the lowest bilirubin reduction rate (as %/hour) which was 0.14, 0.22, 0.31, 0.45, and 0.30 on each subsequent day. Table 3.

Overall Total serum bilirubin reduction rate in %/hr

An independent sample t-test was used to compare the overall bilirubin reduction rate in %/hr among the phototherapy groups. On average, blue light conventional PT reduced bilirubin levels at a rate of 0.84% per hour, which was the highest overall reduction rate, followed by fiberoptic phototherapy at 0.74% per hour and the lowest overall bilirubin reduction rate was in the white light conventional PT group at 0.29% per hour. There was statistically significant difference in the overall bilirubin reduction rate between the fiberoptic and white light conventional PT group (p-value <0.001). However, there was no statistically significant difference when we compared the overall bilirubin reduction rate between blue light conventional and fiberoptic PT (p-value 0.124) Table 4.

Treatment duration

Mean treatment duration

The mean treatment duration in hours was similar in the blue light PT group (68 hours) and fiberoptic PT (69hours) group, with no statistically significant difference (p-value 0.858). However, treatment duration was longer in the white light PT group (p- value 0.002), compared to the mean treatment duration in fiberoptic and white light PT. Table 5.

Treatment side effects

Side effects such as loose stool during PT (blue light PT group-5 participants, white light PT group -3 participants) and skin rash as transient maculopapular rashes (Blue light PT group -2 participants) were noted. No side effects were noted in the fiberoptic PT group. Table 6.

Discussion

In our study, phototherapy was effective in decreasing bilirubin levels in all three groups. The response was greater in the blue light conventional phototherapy (0.84%/h), followed by fiberoptic phototherapy (0.74%/h), whereas the white light conventional phototherapy (0.29%/h) had the lowest response in

lowering serum bilirubin levels. The effectiveness of fiberoptic PT and blue light conventional PT were comparable in terms of bilirubin reduction rate and treatment duration, whereas fiberoptic phototherapy was more effective than white light conventional PT, with a significantly lower bilirubin reduction rate and treatment duration. No side effects were reported in the fiberoptic PT group, while both conventional PT groups reported loose stool. A transient erythematous skin rash was noted with blue light conventional PT.

In our study, the effectiveness of fiberoptic PT and blue light conventional PT were comparable in terms of bilirubin reduction rate, whereas fiberoptic phototherapy was more effective than white light conventional PT, with a significantly lower bilirubin reduction rate. Schuman et al compared continuous fiberoptic PT to conventional PT comprised of both blue and white bulbs in the home setting(13). They found no statistically significant difference in the mean bilirubin reduction rate. The mixture of blue and white light in the conventional PT unit used in in Schuman et al study might have affected the wavelength in their conventional PT group. Furthermore, the continuous PT in the fiberoptic PT group might have contributed to the effectiveness of their fiberoptic PT group. We therefore postulate that continuous PT could further improve the effectiveness of the fiberoptic PT unit. Though not assessed in our study, we hypothesize that patient with physiologic jaundice, who are otherwise healthy, can receive PT at home, as this will assist to reduce hospitalized neonates, which has an impact on workload in the NCU and economic burden to the family and hospital.

In our study fiberoptic phototherapy was more effective than white light conventional PT, with a significantly lower bilirubin reduction rate. A study by Tan increased the irradiance of the fiberoptic PT unit with the aim of improving the efficacy of the fiberoptic PT unit (14). This was compared to conventional PT using white light, and combined phototherapy which consisted of the fiberoptic PT unit and white light conventional PT. Contrary to our findings, the efficacy of fiberoptic phototherapy was distinctly less, with an overall mean decline rate of 0.49%/h, as compared to 0.70%/h in the conventional phototherapy. The best result was obtained by combination exposure (0.97%/h). These findings could be influenced by the surface area covered, improved wavelength spectrum and a higher spectral irradiance in this arrangement, being equal to the sum of the two forms of phototherapy. We speculate that combined phototherapy might be the best way to lower serum bilirubin levels in term neonates receiving white light PT.

In our study the effectiveness of fiberoptic PT and blue light conventional PT were comparable in terms of bilirubin reduction rate. Our results were different from a study by Sarici who compared the efficacy of fiberoptic PT to conventional PT using blue light in healthy term neonates with non-haemolytic unconjugated hyperbilirubinaemia (15). In their study, they increased the illuminated area of their fiberoptic PT unit with the aim of improving its efficacy. The lower bilirubin reduction rate of the fiberoptic phototherapy in their study may be due to its lower spectral irradiance. We deduce that the improved effectiveness noted in the fiberoptic PT group in our study could be explained by the joint effect of a larger illuminated area, higher irradiance and the LED lights in the blue wavelength spectrum, identical to the maximum bilirubin absorption spectrum. Furthermore; it is noteworthy in Sarici’s study, that the

participants in the fiberoptic PT group were slightly older in age as compared to those in the conventional PT group, of which the skin maturity could have influenced their findings.

Tan and Sarici found a shorter treatment duration in their conventional PT units as compared to the fiberoptic PT unit(14, 15). This could be explained by the wavelength, surface area exposed and irradiance in the two different treatment modalities. Their findings were different from our study, as the treatment duration was comparable in the fiberoptic PT group and blue light PT group, and was significantly longer in the white light PT group in our study. We therefore recommend fiberoptic phototherapy and blue light conventional PT as the treatment of choice, over white light conventional PT which has a 1.3 times longer treatment duration. The longer treatment duration might increase the risk of acquiring nosocomial infection and increase the length of hospital stay, which has financial implications to both the hospital and family and also increase workload in the NCU.

In this study no side effects were reported in the fiberoptic phototherapy group. This was consistent with studies by Holtrop, Tan and Al-Alaiyan (7, 14, 16). Studies by Sarici, Rouf et al and Gutta et al observed a significantly higher incidence of skin rashes and loose stools in the conventional phototherapy group which was similar to our findings(15, 17, 18). In our study, participants in the blue light conventional PT group had the highest incidence of side effect. Based on these findings, the fiberoptic PT is the treatment of choice to avoid treatment side effects.

The AAP noted that the most significant bilirubin decline is considered in the first 24hours hours. The AAP further states that with the standard phototherapy units, a decrease of 6–20% of the initial bilirubin level can be expected in the first 24 hours which our fiberoptic phototherapy achieved with the highest bilirubin reduction rate of 0.59%/hr (14% in the first 24 hours) in the first 24 hour (19).

At the most basic, effective treatment to decrease bilirubin levels in neonates with severe jaundice include phototherapy and exchange transfusion. In our NCU, conventional phototherapy is the only treatment modality used. Our study was an effectiveness study, the intent was to compare fiberoptic PT to white and blue light conventional PT as we currently use it in our neonatal unit, and hence we included neonates with both physiologic and pathologic jaundice. Previous studies were efficacy studies, which required substantial deviations from clinical practice. The studies by Holtrop and Tan excluded neonates with haemolytic jaundice, whereas Sarici excluded neonates with haemolytic jaundice, infections, congenital malformations and enclosed haematoma (14–16). The major limitations of our study could be the use of suboptimal conventional phototherapy in the white light conventional phototherapy group.

Conclusion And Recommendation

In conclusion, increasing both irradiance and the illumination area of the fiberoptic PT unit improved effectiveness of phototherapy in term neonates. Fiberoptic PT was comparable to blue light conventional PT, however, showed superiority to white light conventional PT. The treatment duration was comparable in the fiberoptic PT and blue light PT groups, but was significantly longer in the white light PT group. No treatment side effects were observed in the fiberoptic phototherapy group, whereas blue light

conventional PT group had the highest incidence of side effect. We therefore conclude that phototherapy delivered by the fiberoptic blanket is safe and the effectiveness is comparable to that of blue light conventional phototherapy, providing a convenient alternative phototherapy application strategy that obviates the need for eye patches and alleviates treatment side effects. It will also have favorable implications on patient costs and NCU workload if successfully adopted.

We recommend combined phototherapy with the fiberoptic PT unit as this might be the best way to lower serum bilirubin levels in term neonates receiving white light conventional PT. Further studies to explore the feasibility of home phototherapy in our setting should be considered.

List Of Abbreviations

AAP	American Academy of PediatricPediatrics
BIND	Bilirubin Induced Neurologic Dysfunction
KCMC	Kilimanjaro Christian Medical Centre
LED	Light Emitting Diode
NCU	Neonatal Care Unit
PT	Phototherapy
SVD	Spontaneous Vertex Delivery
TSB	Total Serum Bilirubin

Declarations

Ethics approval and consent to participate

Ethical clearance certificate was obtained from Tumaini University College Research Ethical Committee with the research number 2330. Permission to conduct research was also obtained from the head of department of pediatrics and child health department at KCMC. Formal written consent was obtained from the parent or guardians of the study participant and we observed confidentiality of the names of the study participants by using code numbers. Those who did not consent received equal right of medical care.

Consent for publication

Not Applicable

Availability of data and material

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare no competing interest.

Funding

No funding was available for the study.

Author's contributions

HNJ; the main author of the manuscript, conception and design of the study, analysis and interpretation of data, drafting the paper and revising it, approving the final version to be published and accepting accountability for all aspects of the work.

LM; Main supervisor, conception and design of the study, analysis and interpretation of data, drafting the paper and revising it, approving the final version to be published and accepting accountability for all aspects of the work.

RMM; Co-supervisor, conception and design of the study, analysis and interpretation of data, drafting the paper and revising it, approving the final version to be published and accepting accountability for all aspects of the work.

DNM; drafting the paper and revising it, approving the final version to be published and accepting accountability for all aspects of the work.

RNP; drafting the paper and revising it, approving the final version to be published and accepting accountability for all aspects of the work. He is a THRiVE fellow supported through the DELTAS Africa Initiative grant # DEL-15-011 to THRiVE-2 with funding from the Wellcome Trust grant # 107742/Z/15/Z.

All authors have read and approved the manuscript.

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Consort Statement

The study adheres to CONSORT guidelines. Included is a completed CONSORT checklist as an additional file

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Tables

Table 1: Baseline Characteristics (N=41)

Characteristics	n(%)
Age at enrolment (days)	
≤2	4(9.8)
3 to 4	27(65.9)
>4	10(24.4)
Median (IQR) days	4(3 – 4.5)
Sex	
Male	25(61)
Female	16(39)
Address	
Moshi MC	18(43.9)
Moshi DC	14(34.1)
Others	9(22.0)
Types of phototherapy	
Bili blanket	13(31.7)
Blue Light	13(31.7)
White Light	15(36.6)
Mode of delivery	
SVD	36(87.8)
CS	5(12.2)
Type of Feeding	
Exclusive Breastfeeding	35(85.4)
Infant formula milk	2(4.9)
Infant formula milk and breastfeeding	2(4.9)
NPO	1(2.4)
Expressed breast milk	1(2.4)
Age of mother, (Mean ± SD), years	27.63(± 5.97)

Table 2 : Baseline and clinical characteristics: Comparison of the three treatment groups (N=41)

Characteristics	Blue Light (n=13)	Fiberoptic (n=13)	White Light (n=15)	ρ - value
	Mean ± SD	Mean ± SD	Mean ± SD	
Birth weight (Kg)	2.9 ± 0.4	3.3 ± 0.6	3.1 ± 0.5	0.109
Age at Enrolment (Days)	4 ± 1.0	4 ± 1.0	4 ± 1.0	0.318
Gestation age at birth in weeks	38 ± 2.0	39 ± 2.0	39 ± 1.0	0.582
Weight at enrolment	2.7 ± 0.3	3.2± 0.6	2.9 ± 0.5	0.086
Weight at end of PT	2.7 ± 0.3	3.2 ± 0.7	2.9 ± 0.5	0.131
Mean axillary temperature during phototherapy	37.04 ± 0.38	37.06 ± 0.40	37.09 ± 0.43	0.937
Age at onset of jaundice in days	3 ± 1.0	3 ± 1.0	3 ± 0.0	0.829
Serum bilirubin at start of phototherapy µmol/l	294.80 ± 78.49	299.75 ± 76.63	283.71 ± 69.52	0.843

*Continuous data are reported as means ± SDs,

Table 3: Total serum bilirubin reduction rate in %/hr

	0-24h	24-48h	48-72h	72-96h	96-120h
Blue Light	0.56	0.73	0.89	1.21	
Fiberoptic	0.59	0.61	0.76	0.99	
White Light	0.14	0.22	0.31	0.45	0.30

Table 4: Overall bilirubin decline rate %/hours

	Mean ± SD	**ρ**-value*
Fiberoptic	0.74 ± 0.19	<0.001
White Light	0.28 ± 0.12	
Blue Light	0.84 ± 0.40	0.125
Fiberoptic	0.74 ± 0.19	

*Independent sample t-test

Table 5: Mean treatment duration in hrs

Type of Phototherapy	Mean ± SD	p-value*
Fiberoptic	69.46 ± 7.55	0.858
Blue Light	68.77 ± 11.61	
Fiberoptic	69.46 ± 7.55	0.002
White Light	90.33 ± 19.91	

*Independent sample t-test

Table 6: Treatment side effects (N=41)

Characteristics	Fiberoptic PT n(%)	Blue Light PT n(%)	White Light PT n(%)
Hydration status at during phototherapy			
No dehydration	13(100)	13(100)	15(100)
Some Dehydration	0(0)	0(0)	0(0)
Severely dehydrated	0(0)	0(0)	0(0)
Loose stool during phototherapy			
Yes	0(0)	5(38)	3(20)
No	13(100)	8(62)	12(80)
Rashes during phototherapy			
Yes	0(0)	2(15)	0(0)
No	13(100)	11(85)	15(100)
Brown discoloration of skin during phototherapy			
Yes	0(0)	0(0)	0(0)
No	13(100)	13(100)	15(100)

Figures

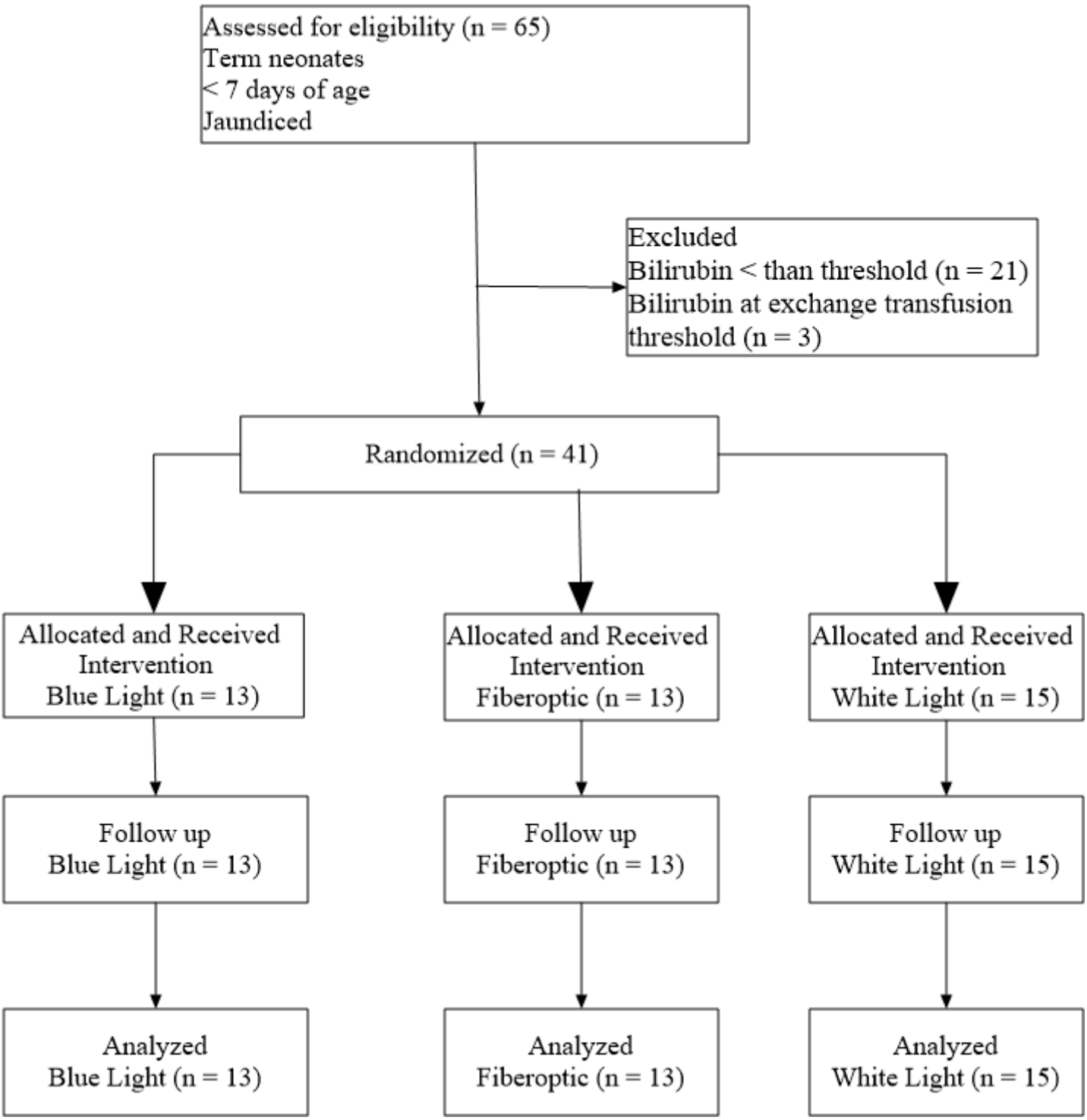

Figure 1

Participant flow. Flow chart showing the progress through the phases of a parallel randomized trial of three groups: blue light conventional phototherapy, white light conventional phototherapy and fiberoptic phototherapy.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CONSORT2010ChecklistBMC.pdf