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RESEARCH ARTICLE

A STUDY ON EFFECTS OF PHOTOTHERAPY IN NEONATES

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ABSTRACT

Background: Newborn jaundice is frequent and typically not harmful. In neonatal hospitals and postnatal wards phototherapy is commonly employed as the initial course of treatment for newborn jaundice because it is non-invasive and has a low risk of long-term side effects, it is currently the recommended course of treatment for newborn hyperbilirubinemia. Although it has some side effects like skin rash, diarrhea, electrolyte imbalance, hyperthermia, circadian rhythm dysfunction, and bronze baby syndrome. **Aim:** The study was conducted to know how phototherapy is effective in neonatal jaundice and to determine the side effects of phototherapy in neonates. **Materials and Methods:** The study was a prospective observational study that was performed through a data collection form for 9 months. The data collected include neonates' demographic details, bilirubin levels, side effects, and recovery rate. **Results:** The study was performed on 900 neonates in different hospitals. From this data 549 neonates are females while 351 are male neonates. Among them, 77% are normal weight while 18% and 5% are underweight and overweight respectively. Among 900 neonates 554 are with phototherapy and 346 are without phototherapy. In this 539 are recovered 15 are not recovered and neonates experienced rashes of 426 while 346, 447 experienced dehydration and skin color changes respectively. **Conclusion:** According to our study, we suggest that sun exposure is a natural remedy for newborn jaundice. Patients with hyperbilirubinemia require phototherapy for a minimum of 12 to 24 hours. The overall amount of bilirubin determines how long phototherapy will last.

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INTRODUCTION

Newborn jaundice is frequent and typically not harmful. Both the skin and the whites of the eyes turn yellow as a result. Neonatal jaundice is the medical name for jaundice in infants. Brown or black complexion types may have more difficult-to-see yellowing of the skin. The soles of the feet or the palms of the hands may make it easier to see.

Additional signs of jaundice in newborns may include

- Dark yellow pee (the pee of a newborn baby should be colorless)
- Pale excrement (it ought to be orange or yellow)

Furthermore, a newborn baby's liver is less efficient at eliminating bilirubin from the blood because it is still developing. [1] In neonatal hospitals and postnatal wards, phototherapy is commonly employed as the initial course of treatment for newborn jaundice. In newborns, phototherapy is a safe and efficient way to lower or stop the rise of serum-unconjugated bilirubin levels and lessen the need for exchange transfusions. [2] About 50% of kids born on time and 80% of preterm babies experience jaundice, which typically manifests two to four days after birth and goes away on its own in one to two weeks. The buildup of bilirubin in the skin is the cause of jaundice. Reduced bilirubin excretion and accelerated red cell breakdown account for the majority of jaundice in newborns. Jaundice risk factors also include hemolysis, some metabolic and genetic diseases, and breastfeeding. Unconjugated bilirubin has the potential to be neurotoxic, resulting in an encephalopathy that can be transient or chronic and cause seizures, hearing loss, and cerebral palsy. Hospital phototherapy reduces infant jaundice by using either conventional or fiberoptic lights. [3] Because phototherapy is noninvasive and has a low risk of serious side effects, it is currently the recommended course of treatment for newborn hyperbilirubinemia. In terms of labor, tools, and disposal costs, it is also affordable, practical, and simple to use. Both the safety and effectiveness of phototherapy have been shown over an extended period of use. Even severe hemolytic hyperbilirubinemia can be effectively managed with high-intensity phototherapy at saturation dose; pack cell

transfusions are the sole necessary treatment for the ensuing anemia. It should be emphasized, therefore, that the baby's health and the bilirubin levels should always be closely monitored. After 2000 hours of usage, the lights should be changed regularly and kept cold during phototherapy. [4] Nowadays, phototherapy is the recommended course of care for newborns. The rate at which phototherapy works is primarily determined by the dose, which is in turn influenced by the light's wavelength, intensity, and distance from the newborn as well as the surface area of the body exposed to it. Phototherapy systems that use fluorescent bulbs, halogen quartz lamps, light-emitting diodes, and fiberoptic beds are among the commercially available options. [5]

Mechanism: Bilirubin is transformed by phototherapy into water-soluble photoproducts that can be eliminated without the need for hepatic metabolism. The excretion half-lives of the byproducts of configurational isomerization (bilirubin isomer 4Z, 15E) and structural isomerization (lumirubin) are 13 hours and 1.9 hours, respectively. Based on the facts that these photoproducts are polar and do not pass the blood-brain barrier, as well as the apparent reversibility of acute bilirubin encephalopathy with prompt, intensive therapy, it is hypothesized that these photoproducts are not neurotoxic. This theory has not been validated by direct scientific evidence. Therefore, more bilirubin conversion may not be very beneficial until the photoproducts are eliminated. [6]

Types of Lights used in Phototherapy: [7]

- ***Micro-Lite:*** Halogen lights in white These can deliver 10 to 30 µ W/cm2/nm and should be placed above the little one. They use a quartz halogen light bulb to provide light, and because of their propensity to heat up, the manufacturer advises against placing them any closer than 52 cm from the baby. Even with low irradiance levels, the lights can still be brilliant.
- ***Fluoro-Lite:*** Two fluorescent lights, one blue and one white For the fluorescent blue tubes to qualify as special phototherapy lamps, they must bear the serial number TL52/20W or F20T12/BB. The best type of light for lowering bilirubin is blue light. The combined output should be 12µW/cm2/nm. The amount of light administered is much decreased when it is directed at the infant's side.
- ***Ohmeda Biliblanket:*** Halogen light in blue A halogen light bulb aimed into a fiberoptic mat is used in this. The light that remains is blue-green after the infrared and ultraviolet wavelengths are eliminated by a filter. Three settings are available: low, which is 15 µ W/cm2 /nm; medium, which is 25 µ W/cm2 /nm; and high, which is 35 µ W/cm2 /nm. For the blanket to work, it needs to be placed right up against the baby's skin. Placing the baby on the blanket to provide "double" phototherapy and increasing the surface area exposed, can be utilized as the only source of phototherapy or as an addition to traditional treatment. Biliblankets should not be applied to babies with skin integrity issues or fewer than 28 weeks gestation.
- The blue fluorescent light MedelaBilibed A plastic crib with a stretched plastic cover over the top for the infant to rest on is equipped with a blue fluorescent tube. The infant gets nursed on the plush plastic cover while wearing the Bilicombi baby suit. Velcro fasteners allow the suit to be fastened to the cot. Delivered irradiance can reach up to 40 W/cm2 or nm.
- When it comes to lowering the need for phototherapy in the first four days of life for healthy low birth weight babies with hyperbilirubinemia, blue-green fluorescent light may be superior to blue fluorescent light after 24 hours. When compared to conventional phototherapy (which uses halogen-quartz bulbs), hospital phototherapy employing blue LED lights may be more successful in cutting down on the amount of time that infants, both term and preterm, spend under phototherapy.[3]

Side Effects: Interference with mother-infant bonding, temperature imbalance and water loss, electrolyte imbalance, bronze baby syndrome, and circadian rhythm dysfunction are among the short-term negative effects of phototherapy. Furthermore, there are a few long-term adverse effects linked to phototherapy, including skin cancer, melanocytic nevi, allergic reactions, patent ductus arteriosus, and retinal impairment.[8] There are additional possible, more dangerous adverse effects of phototherapy, even though the majority of them are mild and temporary, such as skin rash, diarrhea, increased insensible water loss, and hyperthermia. Phototherapy has the potential to induce hypocalcemia and disrupt circadian rhythm, which might result in irritation. The suppression of melatonin secretion is most likely the cause of both of these negative effects. Through the stimulation of calcium-dependent potassium channels and the nitric oxide–cyclic guanosine monophosphate pathway, phototherapy relaxes arterial smooth muscle. In addition to other hemodynamic abnormalities such as an increase in peripheral blood flow and a decrease in mean arterial pressure, this could result in the ductus arteriosus reopening. [6] For skin disorders, phototherapy is usually regarded as safe. On the other hand, PUVA-related adverse effects include blisters, folliculitis, dry or itchy skin, redness, and nausea. Skin cancer and early skin aging are long-term adverse effects. [9]

***Complications*:** [10]

- Water loss due to diarrhea (if present) and increased peripheral blood flow
- Overheating: keep an eye on the newborn's temperature
- Rash
- Diarrhea resulting from an overactive intestine
- Transient intolerance to lactose
- Damage to the retina and "bronzing" in newborns with conjugated hyperbilirubinemia

***Aim*:** How phototherapy is effective in neonatal jaundice

Objectives

- To determine the effectiveness of phototherapy in neonatal jaundice
- To determine the side effects of phototherapy in neonates

MATERIALS AND METHODS

Sample Size: 900 Neonates
Duration of Study: 9 Months
Study Site: Different Hospitals (Government & Private)

Study Type: Prospective Observational study

Inclusion Criteria

- Neonates with Jaundice are included

Exclusion Criteria

- Children were excluded
- NICU babies were excluded
- Neonates with other comorbidities were excluded

Sources of the Data: Using data collection form

RESULTS

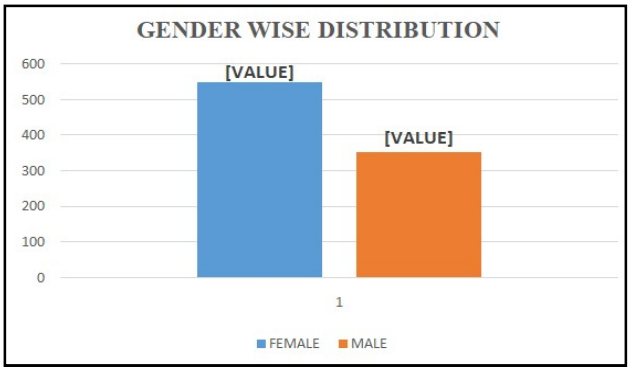

Fig. 1. Gender wise Distribution chart

Among 900 Neonates, 549 are female neonates while 351 are male neonates

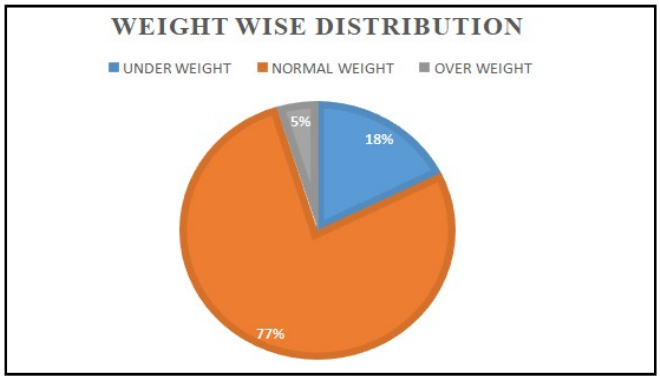

Fig. 2. Weight Distribution chart

Among 900 Neonates, 77% neonates are with Normal weight, 18% neonates are underweight while 5% are overweight.

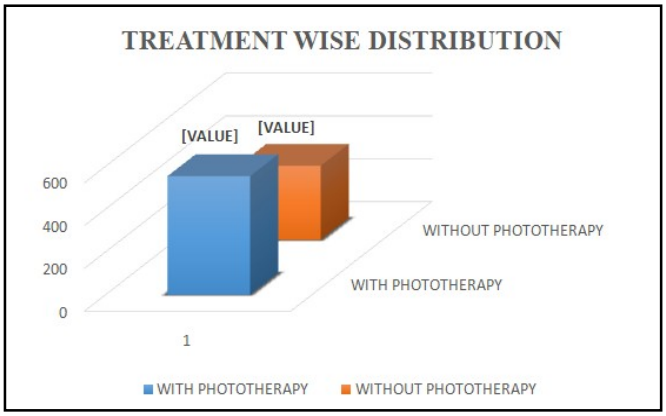

Fig. 3. Treatment wise Distribution chart

Among 900 Neonates, 554 neonates are under phototherapy treatment while 346 neonates are without phototherapy. Among 900 Neonates, 539 are recovered while 15 are not recovered. Among 900 Neonates, 426 neonates experienced Rashes while 346 and 447 are experienced Dehydration & skin colour changes respectively

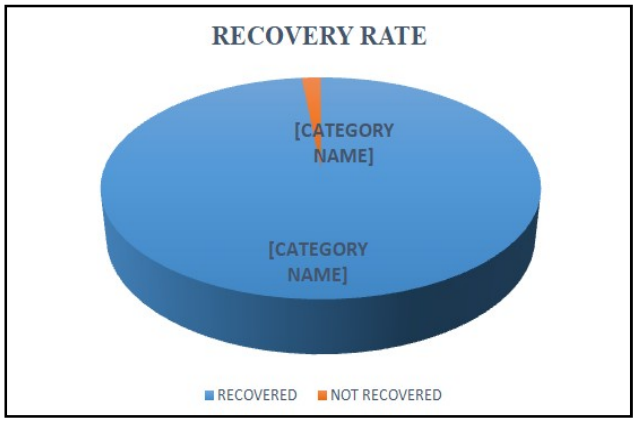

Fig. 4. Distribution chart of Recovery rate

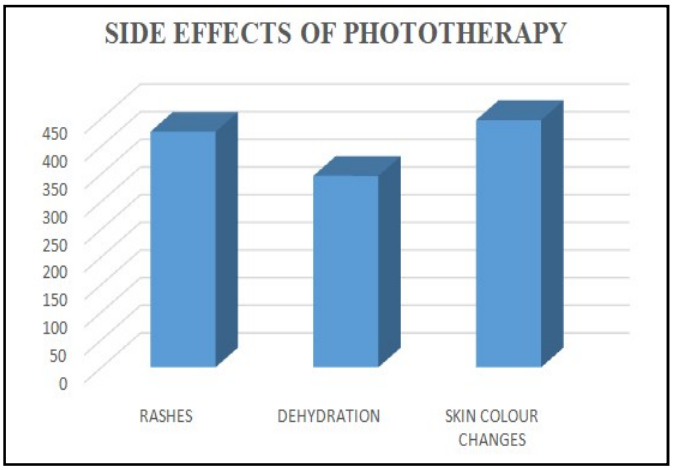

Fig. 5. Distribution chart of side effects of phototherapy

DISCUSSION

The study was performed on 900 neonates in different hospitals based on our inclusion criteria and the data was collected through a questionnaire. The data collection form includes patients' demographic details, birth history, bilirubin levels recovery rate, and side effects. Throughout the data, 549 are female neonates and 351 are male neonates. Most of the neonates are with normal weight i.e., 77% while 18% of neonates are underweight and 5% are with overweight. Among 900 neonates, 554 neonates are under phototherapy treatment while 346 neonates are without phototherapy among these 554 neonates, 539 recovered with phototherapy while 15 did not recover 426 neonates experienced rashes, 346 experienced dehydration, and 447 experienced skin colour changes. Through this study, we determined that phototherapy is effective in treating neonatal jaundice and neonates are experiencing some side effects like rashes, dehydration, and skin color changes.

CONCLUSION

According to our study, we suggest that sun exposure is a natural remedy for newborn jaundice. Patients with

hyperbilirubinemia require phototherapy for a minimum of 12 to 24 hours. The overall amount of bilirubin determines how long phototherapy will last.

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