

## Original Research Article

# Incidence of thrombocytopenia following phototherapy in hyperbilirubinemic neonates in Ardabil City

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## ABSTRACT

**Background:** Jaundice is one of the most common problems in neonatal period. In 60% of term and 80% of preterm neonates are seen during the first week of birth and most cases are physiologic. Hyperbilirubinemia is the most common cause of jaundice in newborns. Phototherapy is used to treat it, which seems to be safe. Some studies showed that thrombocytopenia is one of the side effects of phototherapy. The aim of this study was to investigate the relationship between thrombocytopenia and phototherapy in newborns.

**Methods:** This is a descriptive study that has been done on 100 neonates with jaundice which requiring phototherapy. A blood sample was taken at the admission time, 24 hours late, end of the phototherapy and 48 hours after the end of phototherapy to measure the bilirubin and the number of platelets along with other necessary tests for the study of hyperbilirubinemia. Data collected by a checklist and analyzed by statistical methods in SPSS version 19.

**Results:** Of all neonates, 55% were boy and 45% were girl with mean age of 8.86 days. The mean platelet count before phototherapy, 24 hours late, at the end of phototherapy, and 48 hours after phototherapy were 298170, 288540, 282620 and 266310, respectively which was statistically significant during time.

**Conclusions:** The results of this study showed that phototherapy can lead to a significant reduction in platelet count in newborns. Also, there wasn't seen any case of thrombocytopenia following phototherapy in the present study.

**Keywords:** Hyperbilirubinemia, Jaundice, Newborn, Phototherapy, Platelet count

## INTRODUCTION

Jaundice is one of the most common problems in neonatal period which observed in 60% of term and 80% of preterm neonates.

Jaundice is one of the most common clinical phenomena in neonatal period which leads to referral to a doctor and receiving diagnostic and therapeutic services.<sup>1</sup> This jaundice usually develops from 2- 4 days after birth and improves after 1 -2 weeks of self-administration. Most

neonatal jaundice are due to increased red blood cell destruction and decreased bilirubin excretion. In the baby jaundice is view when bilirubin reaches to above 5-7 mg/dl.<sup>2,3</sup>

Hyperbilirubinemia in most cases is improved without treatment and does not leave any side-effects. But in a group of patient's jaundices is rising and requiring treatment and if no treatment occurs brain complications and Kernicterus develops.<sup>4</sup> Phototherapy is one of the most commonly used therapies.<sup>5</sup> Phototherapy is used to

treat hyperbilirubinemia in infants and it causes the bilirubin to move from the skin to the blood plasma and to be excreted. Phototherapy performed by conventional or fiber optic lamps in a hospital reduces neonatal jaundice in comparison with non-treatment.<sup>6</sup>

For the effectiveness of phototherapy, the best distance is 20-30 cm and maximum 50 cm.<sup>7</sup> The best wavelength is 420-470 nm which is 450 exclusives.<sup>8</sup> Use of phototherapy though safe, is not free of side effects. The complications of phototherapy included skin rash, watery diarrhea, rise in temperature, dehydration, DNA damage, shivering, retinal damage, nasal obstruction due to eye banding, bronze baby syndrome and hypocalcemia.<sup>9</sup> Different methods are used for treating jaundice which included phototherapy, blood transfusion, drugs and IVIG that among them, phototherapy is widely used to treat unconjugated hyperbilirubinemia.<sup>3,4</sup>

The jaundice that appears on 2-3 days after birth is usually physiological, but it can be in a more severe form. Non-hemolytic familial jaundice (Carpenter syndrome) and jaundice due to early begin breastfeeding usually begin at 2-3 days.

In jaundice which appears after the third day and in the first week, we should consider bacterial sepsis or urinary infection. This jaundice can be caused by other infections such as syphilis, toxoplasmosis, CMV or Enterovirus.

Jaundice caused by severe ECMO or vascular leak syndrome, especially in premature infants can occur on first day or later. Phototherapy starts in the newborn with bilirubin about 16-18 mg/dl and starts in premature infants with low rate. Thrombocytopenia has never been described as one of the complications of phototherapy in any pediatric standard textbooks.<sup>1</sup>

However, knowing the effect of phototherapy on platelet count, reticulocyte count and white blood cell count is very important. Because reducing or increasing them as an index for the diagnosis of some diseases such as infections in newborns. Few studies have been conducted on the effect of phototherapy on blood elements, especially white blood cells. Since the lower platelet can also cause complications such as bleeding and brain damage and even death. This study aims to investigate the incidence of thrombocytopenia following phototherapy in hyperbilirubinemic neonates.

## METHODS

### Study design and follow-up patients

This descriptive cross-sectional study was performed on 100 healthy babies with jaundice which need to phototherapy in the Ardabil city Hospital. A blood sample was taken at admission, 24 hours before the end of phototherapy and 48 hours after phototherapy for

measuring the bilirubin and platelet count along with other necessary tests for hyperbilirubinemia.

### Inclusion and exclusion criteria

Infants with neonatal jaundice, term infants, birth weight between 2500-4000 g and newborns with normal examination were enrolled to the study. Neonates with stop breathing, hemolytic anemia, sepsis, congenital anomalies, ABO, need for transfusion, high direct bilirubin and metabolic disease were excluded from the study.

### Statistical analysis

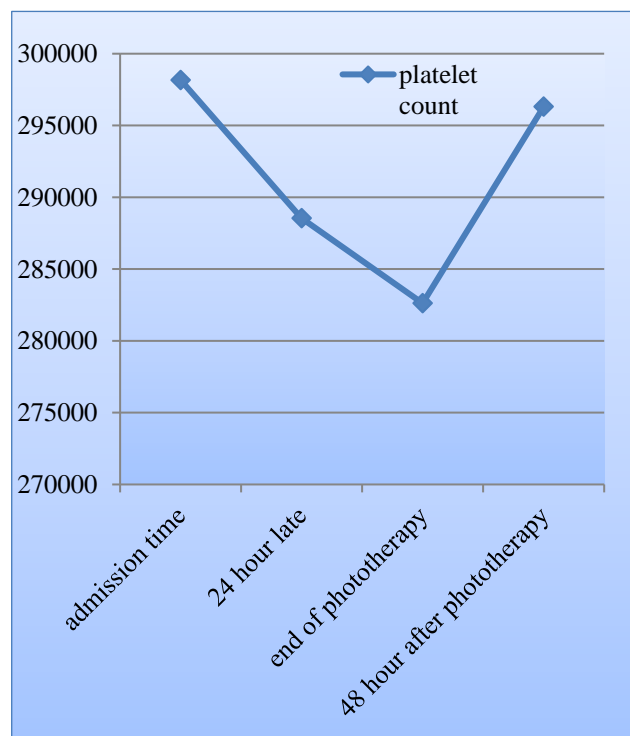
Data were analyzed by SPSS 19 using descriptive and analytical statistical methods. In all tests  $p < 0.05$  was considered significant.

### Consent form

Before study, the parents of the neonates completed the informed consent and then participated in the study.

## RESULTS

A total of 100 neonates were enrolled in the study. Of all infants, 55% were boys and 45% were girls. Of all neonates, 69% had platelet loss after phototherapy of which 42 were boys and 27 were female but no evidence of thrombocytopenia was observed. There was no significant relationship between sex and platelet loss.



**Figure 1: Mean of platelet count by duration of phototherapy.**

The average age of infants who had platelet loss following phototherapy was 6.38±3.13 days and other infants were 6.33±2.48 days and the difference wasn't significant. The average birth weight of infants who had platelet loss after phototherapy was 3.26±4.29 kg and other were 3.4±0.38 kg and. The average total bilirubin for infants who had platelet loss following phototherapy was 16.58±2.2 mg / dl and others were 18.09±2.40 mg / dL and the difference wasn't significant. The average bilirubin direct of neonates who had platelet loss following phototherapy was 0.62±0.6 mg / dl and others was 0.60±0.05 mg / dl and the difference wasn't significant.

The average duration of phototherapy in neonates with platelet loss after phototherapy was 0.9±0.86 days and others was 1.3±0.6 days and there was a significant difference between two groups. The average gestational age of neonates with platelet loss after phototherapy was 38.6±2.27 weeks and others was 38.8±1.55 weeks and the difference wasn't significant. The average platelet count of infants was 298170±77167 in admission time and 24 hours after phototherapy this average reached to 288540±84695 and these changes were statistically significant over time (Figure 1). Compare the changes in mean of platelet counts between times showed that all changes were significant between times. The higher mean was seen in the admission time and the least was in the end of phototherapy (Table 1).

**Table 1: Compare the changes of platelet counts during time.**

Mean of platelet count	Mean±SD	p-value
Admission time	298170±77167	0.008
24 hours late	288540± 84695	
24 hours late	288540± 84695	0.017
End of phototherapy	282620±90171	
End of phototherapy	282620±90171	0.001
48 hours after end of phototherapy	296310±78679	

To determine the incidence of platelet loss following phototherapy in Hyperbilirubinemic neonates by a severity of jaundice, total bilirubin was selected 17.01 as an index that babies with higher bilirubin were considered as severe jaundice and babies with lower bilirubin were considered as mild jaundice. 58% of newborns had severe jaundice and 42% had mild jaundice and of 69 neonates who had platelet loss, 39 had severe and 30 had mild jaundice and out of a total of 31 neonates who did not have platelet loss, 19 had severe and 12 had mild jaundice. There was no significant relationship between jaundice severity and platelet loss.

**DISCUSSION**

As seen Platelet loss following phototherapy was found to be relatively common in this study. Of the 100

neonates who were included in the study, 69% had platelet loss following the start of phototherapy of these 61% were boys and 37% were girls and this platelet loss was in normal range and any cases of thrombocytopenia observed in this study. Also, the total platelet count in patients at 0, 24 hours after the end of phototherapy and 48 hours after phototherapy were 298170, 288540, 282620, 296310 respectively.

As seen by considering the average of initial platelet count as the control group, platelet levels decreased at 24 hours and end of phototherapy and was lower than the initial level that most of it occur in the end of phototherapy and also by considering the average platelet at 48 hours after the completion of phototherapy at the same level as the primary level, it can be resulted that these significant changes were due to phototherapy. Also, there was a significant relationship between duration of phototherapy and platelet loss (P= 0.02).

But there was no statistically significant relationship between the platelet loss of patients after phototherapy with sex, age, birth weight, gestational age, total and direct bilirubin level, severity of jaundice and parity. According to the data it can be assured to the parents that despite the fact that phototherapy may reduce the level of the primary platelet in the baby, this reduction is not limited to requiring special treatment and limiting the life of the baby. In the study of Khara et al, the platelet level of patients was measured at admission time and 24 hours after phototherapy and 48 after the end of phototherapy.

35% of neonates had thrombocytopenia of them 74% had mild thrombocytopenia. In this paper phototherapy has been introduced as one of the reasons for thrombocytopenia that the best reduction in platelet count was in the first 24 hours after phototherapy but there was no significant correlation between age, sex, duration of phototherapy, gestational age, severity of jaundice, birth weight with thrombocytopenia.<sup>10</sup>

In the present study, there were no cases of thrombocytopenia in 100 newborns with physiologic citer and 69 newborns had platelet loss compared to baseline. Also, there was a significant relationship between duration of phototherapy and platelet loss.

But there was no significant relationship between age, sex, gestational age, severity of jaundice, birth weight and platelet loss. In the study of Pishva et al colleagues, of 101 neonates suffered from jaundice, 50 neonates (49.5%) were suffering from thrombocytopenia after phototherapy. Reduced platelet count during the first 24 hours of phototherapy was observed.

In the present study thrombocytopenia was not observed but platelet loss was observed in normal range and the rate of platelet loss at the end of phototherapy was more than the first 24 hours of phototherapy.<sup>11</sup> In the study of Shahyan et al, on the second day, 40.2% of newborns had

platelet increase and 50.98% had platelet decrease. There was no significant relationship between sex, age, weight and bilirubin levels with decreasing platelet count. But there was a significant relationship between phototherapy duration and reducing platelet count that in our study of there was no significant relationship between sex, age, weight and bilirubin rate with decreasing platelet count but there was a significant relationship between phototherapy duration and reducing platelet count.<sup>12</sup>

In the study of Ghaffarpour et al, there was a significant increase in platelet count after phototherapy but the changes in reticulocyte and lymphocyte and neutrophil were not meaningful. In our study, unlike the above study there was a decrease in the number of platelets not an increase in its number and the study was not conducted for other blood types.<sup>13</sup> In the study of Lucey et al, it was found that there was no relation between gestational age and thrombocytopenia after phototherapy which was in line with the results of our study.<sup>14</sup>

In the study of Sakha et al, leukocytes increased during phototherapy and the increase in white blood cells had significant relation with age and due to limitations, the number of white blood cells in newborns was not checked. In this study, the average platelet count of patients 48 hours after the phototherapy was similar to that of the primary platelet count and the resulting changes can be due to phototherapy.<sup>15</sup>

## CONCLUSION

The results of this study showed that phototherapy only reduced the number of platelets in normal range but did not require thrombocytopenia in neonates. Also, there was a significant relationship between the duration of phototherapy and platelet loss and there was no significant relationship between birth weight, sex, age, nullipar or multiple pregnancy, gestational age and platelet count.

Also, we could say that the changes in the number of platelets based on the average platelet count 48 hours after the completion of phototherapy, have been due to phototherapy. It is suggested that another study be conducted to investigate platelets on a daily for register platelet changes and check the relationship between phototherapy and other blood types.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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