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Original Research Article

A Study to Compare Clinical Signs of Physiological Jaundice with Transcutaneous Bilirubin Estimation among Neonates in a Selected Hospital in Mangaluru

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ABSTRACT

Physiological jaundice in neonates is known to be one of the most common clinical conditions. Although it is known to be often harmless yet needs monitoring to prevent complications such as kernicterus. It is important to monitor the neonate's bilirubin levels in order to prevent hyperbilirubinemia. The bilirubin levels can be measured through invasive (serum analysis) and non invasive measures (clinical signs and transcutaneous bilirubin estimation).

Aims: The present study aimed at assessing the physiological jaundice among neonates with clinical signs using Cramer's rule and further comparing with transcutaneous bilirubinometer reading.

Methodology: The study was conducted among 48 neonates in the postnatal wards of Father Muller Medical College Hospital using purpose sampling technique. The samples were selected based on the inclusion criteria. The bilirubin levels of the neonates were assessed for two consecutive days. The compiled data was analyzed in terms of objectives using descriptive and inferential statistics.

Results: The mean value of bilirubin on day 2 by clinical assessment method was 8.66 ± 3.27 and of transcutaneous bilirubin value was 8.57 ± 2.89; and the mean value on day 3 by clinical assessment was 8.58 ± 3.05 and of transcutaneous bilirubin value was 8.79 ± 3.20 respectively. On compilation and analysis of data to find the difference between two methods of assessment, the obtained t value of clinical signs and transcutaneous bilirubinometer readings was 0.19 and 0.66 on two consecutive days and were not significant at $p < 0.05$ level. Hence the study findings showed that there is no statistical difference between clinical assessment and transcutaneous bilirubin estimation.

Key words: Physiological jaundice, clinical signs, transcutaneous bilirubin estimation, transcutaneous bilirubinometer.

INTRODUCTION

Physiological jaundice is a common clinical and universally occurring condition in healthy, full-term newborns. Before birth, neonate is able to eliminate bilirubin through the mother's blood and liver system. After birth, the baby's liver will take over the function of processing bilirubin on its own. Almost all newborns have bilirubin value more than normal level. In most cases, the baby's system continues to develop and can soon process bilirubin. However, some infants may need hospital readmission to prevent serious complications, which can occur due to increase level of bilirubin. [1]

The skin can be assessed for jaundice in daylight. The yellowish

discoloration is first observed on the skin of face. The color change is noticed by blanching the skin so that the underlying yellowness of subcutaneous and blood vessels can be visualized. As the intensity of jaundice increases, there is cephalo-caudal progression of yellowish discoloration. Transcutaneous bilirubin works on the principle of computerized spectro-photometry to provide digital display of total bilirubin. The probe is pressed against the forehead or sternum of the neonate to get the bilirubin value. [2]

The American Academy of Pediatrics recommends that there should be proper evaluation and treatment of hyperbilirubinemia in healthy term neonates. Some of the recommendations include visual inspection of the skin to assess jaundice, testing for total serum bilirubin level, and recording of transcutaneous bilirubin values which help in determining the treatment for jaundice. [3]

The clinical signs are as effective as the transcutaneous bilirubin in estimation of physiological jaundice. Since transcutaneous bilirubin is expensive, the assessment of clinical signs is preferred as it is cost-effective. Hence, the researcher felt a strong need to compare the difference between clinical assessment and transcutaneous checking method in the current setting.

Objectives of the study

1. To assess physiological jaundice among neonates by clinical signs.
2. To assess physiological jaundice among neonates by transcutaneous bilirubin.
3. To compare the clinical signs of physiological jaundice with transcutaneous bilirubinometer reading

MATERIALS AND METHODS

Research Design: The comparative research design was used to conduct this study.

Research Setting: The study was conducted in selected postnatal wards of Father Muller Medical College Hospital, Mangaluru.

Population: The target population in this study consisted of all healthy term neonates in postnatal wards.

Sampling Technique and Sample Size: The sample in this study consisted of 48 healthy term neonates in selected postnatal wards of Mangaluru. The sample in this study was selected by purposive sampling technique.

Instruments:

I - Demographic profile which consists of 6 items - Birth weight, Sex, Weeks of gestation, Mode of delivery, Date and time of birth, and Date and time of assessment

II - Observation checklist on clinical assessment of physiological jaundice using Kramer's rule and the bilirubin level was measured using transcutaneous bilirubinometer.

Method of data collection

The investigator obtained written permission from the authorities of Father Muller Medical College Hospital, Mangaluru. The parents of the neonates were made aware of the purpose, nature of the study, duration and method of data collection. The subjects were selected by purposive sampling technique. Prior to data collection the investigator familiarized her with the parents of the neonates and explained the purpose of the study to them. Confidentiality was assured. An informed consent was taken from the subject's mother. Base line proforma and transcutaneous bilirubin values were obtained from the medical record of the neonates. The neonates were observed in adequate light to perform skin blanching test. The bilirubin level assessed using Kramer's rule was noted. The TCB value was checked and recorded after the clinical assessment. The readings were recorded for 2 consecutive days. The obtained values were recorded in the observation checklist. Inter rater reliability of clinical signs of jaundice was assessed and found to be r = 0.99.

Statistical Analysis

Demographic profile in terms of frequency and percentage distribution.

Comparison of clinical signs of physiological jaundice with transcutaneous bilirubinometer reading using paired 't 'test

RESULTS

The analyzed data has been presented under the following headings.

Section 1: Demographic profile of the subjects

Section 2: Distribution of clinical signs of physiological jaundice among neonates using Kramer's rule

Section 3: Description of physiological jaundice among neonates by transcutaneous bilirubin

Section 4: Comparison of clinical signs of physiological jaundice with transcutaneous bilirubinometer reading using paired 't' test.

Section 1: Demographic profile of the subjects

Table 1: Distribution of baseline variables of neonates N = 48

Sl. No.	Baseline variables	No. 'f'	Percentage '%'
1	Birth weight		
	2-2.5 kg	4	8.3
	2.5-3 kg	19	39.6
	3-3.5 kg	18	37.5
	3.5-4 kg	5	10.4
	>4 kg	2	4.2
2	Weeks of gestation		
	37-38 weeks	7	14.6
	38-40 weeks	41	85.4
3	Mode of delivery		
	Normal vaginal delivery	26	54.2
	Lower segmental caesarean section	22	45.8
4	Sex of neonates		
	Male	28	58.3
	Female	20	41.7

The data in Table 1 shows that majority of the neonates had a birth weight of 2.5 to 3kg i.e.; 19 (39.5%) and only 2 (4%) neonates were >4kg of birth weight. Also majority, 41 (85.4%) of them were born between 38 - 40 weeks of gestation and 26 (54.1%) of mothers had normal vaginal delivery. The majority of the neonates 28 (59.5%) born were males.

Section 2: Description of clinical signs of physiological jaundice among neonates using Kramer's rule

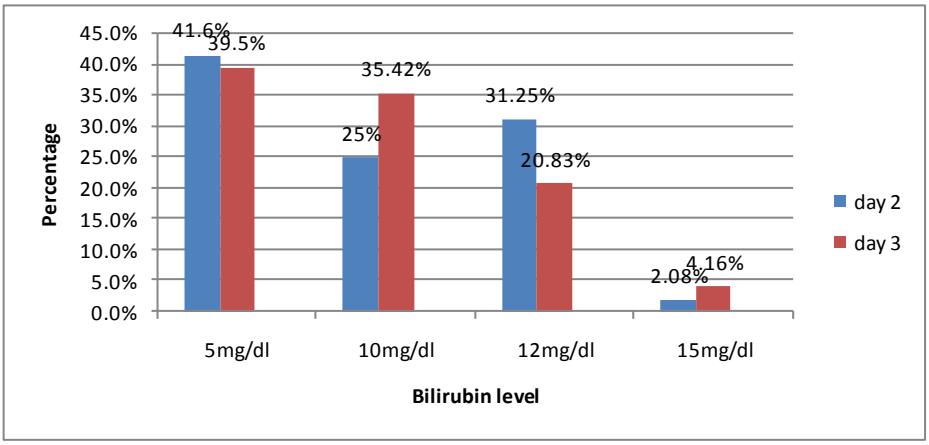

Figure 1: Distribution of neonates based on clinical signs of physiological jaundice on two consecutive days.

On Day 2, 20 (41.6%) neonates were found with bilirubin level of 5mg/dl and 1 (2.08%) neonates had bilirubin level of 15mg/dl. On Day 3, 19 (39.5%) neonates were found with the bilirubin level of 5mg/dl and 2 (4.16%) neonates had bilirubin level of 15mg/dl.

Section 3: Description of physiological jaundice among neonates by transcutaneous bilirubin

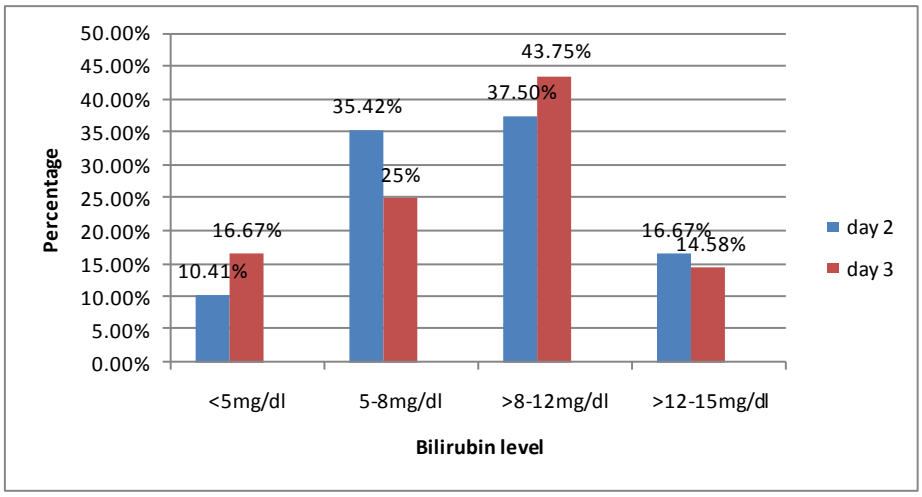

Figure 2: Distribution of neonates based on transcutaneous bilirubin reading on two consecutive days.

On Day 2, 18 (37.5%) neonates had transcutaneous bilirubin level within the range of >8 – 12 mg/dl and 5 (10.41%) had transcutaneous bilirubin level <5 mg/dl. On Day 3, 21 (43.75%) neonates had transcutaneous bilirubin level within the range of >8 – 12 mg/dl and 7(14.58%) had transcutaneous bilirubin level >12 - 15 mg/dl.

Section 4: Comparison of clinical signs of physiological jaundice with transcutaneous bilirubinometer reading using paired t test.

Table 2: Distribution of bilirubin level according to mean, SD and t value **N=48**

Assessment of physiological jaundice	Mean	Standard deviation 'SD'	t value	p value
Day 2				
Clinical signs	8.66	3.27	0.19	2.02
Transcutaneous bilirubin	8.57	2.89		
Day 3				
Clinical signs	8.58	3.05	0.66	2.02
Transcutaneous bilirubin	8.79	3.20		

The above table shows that on day 2, the mean value of bilirubin with clinical signs was 8.66 ± 3.27 and with transcutaneous bilirubin value was 8.57 ± 2.89 and on day 3, the mean value of bilirubin with clinical signs was 8.58 ± 3.05 and with transcutaneous bilirubin value was 8.79 ± 3.20. The paired t test value on day 2 was 0.19 and on day 3 was 0.66 which showed there is no statistical difference between clinical assessment and transcutaneous bilirubin level as obtained p value is 2.02 and 2.02 respectively.

DISCUSSION

Clinical signs of physiological jaundice among neonates using Kramer's rule

Clinical signs of physiological jaundice were assessed by blanching the skin of the neonates for two consecutive days. By using Kramer's rule as the assessment tool, on day2 41.6% neonates were found with bilirubin level of 5mg/dl and 2.08% neonates with bilirubin level of 15mg/dl. The same neonates were assessed on the day 3 and it was found that 39.5% neonates had bilirubin level of 5mg/dl and 4.16% neonates with bilirubin level of 15mg/dl.

A comparative study on validity of neonatal jaundice evaluation by primary health care workers and physicians was conducted in Karachi, Pakistan. Among 193 infants identified for jaundice by using Kramer's scale, 143 infants blood was collected for serum bilirubin testing. Out of 143 infants, 137 infants belong to 1 – 20 days of age. In this age group 36 (26.3%) infants had serum bilirubin level ≥15 mg/dl and 7 (5.1%) had serum bilirubin level ≥20 mg/dl. The study concluded that primary health care workers are able to identify

hyperbilirubinemic neonates with adequate sensitivity of the use of Kramer's scale for assessing bilirubin level still stands out to be a initial tool for assessment of bilirubin levels in neonates to rule out the need for further investigation and follow up. [4]

Physiological jaundice among neonates by transcutaneous bilirubin

Transcutaneous bilirubin levels were assessed on two consecutive days. On day 2, 37.5% neonates had transcutaneous bilirubin level >8-12 mg/dl and10.41% of neonates were with transcutaneous bilirubin level of <5 mg/dl, with mean and standard deviation as 8.57± 2.89. The same neonates were assessed on day3 and found that 43.75% neonates had transcutaneous bilirubin level >8-12 mg/dl and 14.58% had transcutaneous bilirubin level of >12-15 mg/dl, with mean and standard deviation as 8.79 ± 3.20.

A similar study was conducted in Maharashtra on assessment of transcutaneous bilirubinometer in the evaluation of neonatal Hyperbilirubinemia among neonates. The result revealed that among 99 neonates the mean and standard deviation of serum bilirubin level and TCB were 12.03 ± 5.69 and 9.63 ± 4.69 mg/dl respectively. Hence, the study concluded that TCB measurement for estimating bilirubin level among high risk neonates is considered as a useful screening method. [5]

Comparison of clinical signs of physiological jaundice with transcutaneous bilirubinometer reading using paired 't 'test

The comparison between clinical signs and transcutaneous bilirubin was done on two consecutive days. The mean value of bilirubin with clinical signs was 8.66 ± 3.27 and with transcutaneous bilirubinometer the value was 8.57 ± 2.89 on day 2 and on day 3, the mean value of bilirubin with clinical signs was 8.58±3.05 and with transcutaneous bilirubinometer the value was 8.79±3.20. The t value obtained on day 2 assessment was 0.19 and on day 3 was 0.66 which is not significant at $p<0.05$ level of significance. Hence the study proves that clinical assessment of jaundice is still a standard assessment tool which has to be carried out at every assessment hour/day of a neonate's life.

However, a study on the joint use of human and electronic eye by De Luca, Daniele, Zecca et al found that clinical estimation of jaundice is considered unreliable as errors (75%) were performed during early morning hours. Moreover, because of well known variation of colour perception, it is unreasonable to expect clinical signs as a reliable tool. [6]

CONCLUSION

The findings of the current study revealed that there is no statistical significant difference in the level of jaundice between clinical signs and transcutaneous bilirubinometer findings. Hence the clinical signs could be as effective as transcutaneous bilirubinometer readings in assessing physiological jaundice among neonates. It also reflects that any health personnel who are well trained in assessing clinical signs of jaundice, there is a potential for improving the assessment skills and prevent unnecessary invasive test for the neonates. It can further guide in early interventions and reduce the burden on parents in terms of cost, hospitalization and need for invasive procedures.

Conflict of Interest: None declared

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