



## Comparison OF TCB And Picterus Jaundice Bilirubin Examination In Newborns at RSA UGM in 2025

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### Abstract

**Background:** One of the health problems often experienced by infants is jaundice neonatorum, which is a condition where bilirubin levels are above 10 mg%. Based on a study performed in the infant room at RSA UGM in December 2024, the incidence of newborns who are treated with phototherapy is more than 50%. Transcutaneous Bilirubinometry (TCB) is a non-invasive bilirubin screening tool for infants with a gestational age of more than 36 weeks, born after 24 hours, using optical spectroscopy, with bilirubin in the skin. The jaundice screening device is certified for clinical use. A photo was taken and analyzed to display bilirubin levels within a few seconds (Product licence by Ministry of Health Number 20101323603).

**Objective:** This study aims to determine whether there are differences in the results of bilirubin examination using Transcutaneous Bilirubin and Petechial Jaundice.

**Method:** This research involved newborns who were full-term or more than 37 weeks of gestation, had a birth weight of more than 2500 grams, and were at least 24 hours old.

**Result:** This study was conducted at RSA UGM from April to July 2025. The sampling technique used was accidental sampling. Out of 42 participants, 23.8% had a gestational age of less than 38 weeks, 69% had a gestational age between 38 and 40 weeks, and 7.2 % had a gestational age of more than 40 weeks. From the data analysis of 42 newborns, the bilirubin levels using Transcutaneous Bilirubin had an average of 8.14 mg/dl. while the bilirubin levels using Picterus had an average of 7.90 mg/dl. Analysis using a paired sample T-test to compare the averages of two data groups showed a statistically significant difference. The results showed a significance value of 0.000 for the TCB Bilirubin and Picterus Jaundice test. The significance level for Picterus bilirubin is 0.000. A P value < 0.05 indicates that the results do not show a significant difference in measuring bilirubin using Pictures Jaundice and Transcutaneous Bilirubinometry.

**Conclusion:** Picterus Jaundice can be used as an alternative method in screening or examining bilirubin in newborns.

**Keywords:** bilirubin, transcutaneous bilirubinometry, picterus jaundice, newborn

### 1. INTRODUCTION

One of the diseases commonly experienced by newborns in Indonesia is hyperbilirubinemia. Hyperbilirubinemia is an excessive accumulation of bilirubin in the blood, characterized by jaundice or icterus, changes in yellowish color on the skin, sclera, and nails (1). Clinical conditions in newborns include hyperbilirubinemia, which occurs in 85 % of full-term infants.

Hyperbilirubinemia is when the amount of bilirubin in the blood increases, due to either physiological or non-physiological factors. This is called jaundice, characterized by yellowish coloring of the newborn. This condition is common in the first week of life, as babies produce bilirubin at levels higher than adults, who generate bilirubin continuously in daily

metabolism (2,3,4). According to the American Academy of Pediatrics (AAP) in the Clinical Practice Guideline Revision: Management of Hyperbilirubinemia the Newborn Infant  $\geq 35$  Weeks of Gestation (5), bilirubin screening should be performed universally before the baby is discharged from the hospital. The AAP emphasizes that bilirubin screening can be done using either serum or TCB methods, but TCB results still need to be confirmed with a serum test if high levels are found or there are risk factors for neurotoxicity.

RSA UGM, as a teaching hospital and healthcare provider, plays an important role in the implementation of effective and efficient diagnostic technology. Therefore, this study was conducted to compare the results of bilirubin tests for Pictet-Spiegel jaundice with TCB in newborns with jaundice at RSA UGM, to determine the extent to which Pictet-Spiegel jaundice and TCB can be used as screening methods or as alternative non-invasive bilirubin tests in clinical practice.

**2. MATERIALS AND METHODS**

This study uses primary and secondary data. Primary data is obtained through direct observation and secondary data from patient medical records (6). The research design uses a Quasi-Experimental Design. The research samples used in this study are newborns given treatments to check bilirubin with TCB and Petechial Jaundice, and then observed and repeated for all newborns. In this study, 42 newborn baby samples were divided into a control group and a treatment group. The control group consisted of babies whose bilirubin was examined using a

calibrated TCB device, while the treatment group consisted of babies whose bilirubin was examined using Picterus Jaundice.

**3. RESULTS**

The result of this study from 42 newborn, It shows that the average bilirubin value in Picterus is 7.90, with a minimum bilirubin value of 4.74 and a maximum bilirubin value of 16.9. Meanwhile, the average bilirubin using TCB is 8.14, with a minimum bilirubin value of 6.5 and a maximum bilirubin value of 13.9.

Based on the output of the above table sample correlations, it is known that the Sig. The value of Levene's Test for Equality of Variances is  $0.562 > 0.05$ , which can be interpreted as indicating that the variance of data between the Picterus group and the TCB group is homogeneous or the same (7,8). Therefore, the interpretation of the Independent Samples Test output table above is based on the values found in the "Equal Variances Assumed" table. It shows that the Sig (2-tailed) value is 0.000. If the Sig (2-tailed) value  $< 0.05$ , that means there is not much difference between the bilirubin test using Picterus and the bilirubin test using TCB. Based on the "Paired Samples Test" output table above, it is known that the Sig. (2-tailed) value is  $0.000 < 0.05$ , which means a good correlation was found between total bilirubin, jaundice, and TCB. There is not much difference between the bilirubin test using Picterus and the bilirubin test using TCB, which means there is no difference in the bilirubin test results, so it can be used as a screening tool to estimate total bilirubin levels in neonatal jaundice.

**Table 1. Table Paired Sample Statistic**

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	The result with Picterus	7.90	42	2.377	.367
	The result with TCB	8.14	42	2.495	.385

Table2. Table Correlation	Paired Sample			
	Paired Sample Correlation	N	Correlation	Sig.
Pair 1		42	.562	.000

The Paired Sample T-Test		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	The result Picterus - and TCB	-.238	2.283	.352	-.949	.473	-.676	41	.503

Table 3. Paired Sample T- Test

4. DISCUSSION

This study used respondents from all newborns born at RSA UGM with a birth weight above 2500 grams. The study was conducted from June to August 2025 until the sample size was met. Based on the study results comparing bilirubin examinations in newborns at RSA UGM in 2025, 42 respondents underwent both bilirubin and TCB examinations at almost the same time.

From this study, an analysis of 42 newborn respondents by comparing Picterus bilirubin examination and TCB at RSA UGM using the Independent Sample Test, it showed a value of 0.000. Which is  $0.000 < 0,05$  that means a good correlation was found between total bilirubin, jaundice, and TCB. There is not much difference between the bilirubin test using Picterus and the bilirubin test using TCB, which means there is no difference in the bilirubin test results.

These results are also supported by Hasanah (2023) in a literature study on the Effectiveness of Smartphone-Based Jaundice Screening in Reducing Invasive Procedures in Neonates (9). This research presents a review of 11 selected journals and concludes that smartphone-based bilirubin assessment shows a correlation value comparable to TSB and TCB values. Smartphone-

based applications can be considered as noninvasive screening tools for monitoring bilirubin in neonates. Smartphone-based jaundice screening methods are expected to be applied, developed, and have their implementation algorithms established in hospitals, so they can be used as a screening tool to estimate total bilirubin levels in neonatal jaundice.

These results support the research by Prutri et.al (2022) (in the study titled “Validating a Sclera-Based Smartphone Application for Screening Jaundiced Newborns in Ghana,” where the analysis of the neo SCB image validation showed that babies identified with TSB > 14.62 mg/dl (250 mmol/L) had high sensitivity, specificity, and area under the receiver operating characteristic curve (AUC) (1). The results were a sensitivity of around 0.94 (95% CI, 0.91 to 0.97), specificity of around 0.73 (95% CI, 0.68 to 0.78), and an AUC of about 0.90.

This is also in line with the research in the study titled Bilirubin: An Intelligent Mobile Phone-based Platform to Monitor Newborn Jaundice. The study found that the bilirubin application had a mean absolute error (MAE) of 1.807 with a correlation of 0.701 when compared to the TSB value as a reference/standard (10).

Bilirubin (TCB) and picterus joundice measurement is a non-invasive, rapid, and repeatable method. With the availability of modern bilirubinometers (e.g., Bilichek, JM-103), there has been growing interest in validating TCB as a reliable screening tool for neonatal hyperbilirubinemia.

## 5. CONCLUSION

From the analysis data of 42 newborn respondents, there was no difference in the examination results between Picterus bilirubin and TCB bilirubin tests.

## 6. ACKNOWLEDGEMENTS

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