

UNIVERSITI TEKNOLOGI MARA

**EVALUATION OF A TRANSCUTANEOUS
BILIRUBINOMETER AMONG NEONATAL
JAUNDICE IN A TERTIARY HEALTH CARE
PROVIDER**

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ABSTRACT

Neonatal jaundice has long been associated with kernicterus, a severe neurological damage of the brain if late detection. Emerging point of care modalities such as transcutaneous devices replaces laboratory measures for screening neonatal jaundice. Transcutaneous bilirubinometer (TcB) improves patient management and care by reducing turnaround time and invasive blood sampling. Implementing a TcB may prevent this neurological sequela by early initiation of treatment. Currently, local clinical practice guidelines suggest the utilisation of TcB for detecting neonatal jaundice due to the device's high sensitivity and good correlation with the gold standard. Relating to the current usage of TcB, a prospective cross-sectional study was performed to determine the accuracy and reliability of TcB against total serum bilirubin (TSB) among neonatal jaundice in a tertiary health care provider. Randomly selected term or near-term neonatal jaundice infants admitted or noted as jaundiced between March and June 2021 were recruited. Both sternum and forehead transcutaneous bilirubin measurements were taken for each recruited infant and compared to TSB. Data collected were analysed using SPSS version 22. This study found that TcB is an accurate and reliable device with a sensitivity of 96.2% and 92.5% for sternum and forehead measurements, respectively. Evidence follows low false negatives results, a good correlation ($0.89 < r < 0.93$), and moderate to substantial agreement of the device compared to TSB. This study did not specify any cut-off value of TcB for reflex TSB testing. A low cut-off value at 150 $\mu\text{mol/L}$ may increase TSB measurement and indirectly burden healthcare costs. This study recommends the utilisation of TcB as a screening tool for jaundice detection and using the TcB cut-off as previously suggested in local clinical practice guidelines for jaundice management.

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CHAPTER ONE

INTRODUCTION

1.1. Research background

Neonatal jaundice (NNJ) or hyperbilirubinemia is not uncommon among neonates. Globally, the prevalence of NNJ is estimated to be present in 60% of term babies [1], [2] and almost 80-100% of preterm babies [2]–[4]. Neonatal jaundice (NNJ) is a common cause for readmission in which approximately up to 85% must be readmitted to the hospital during their first week of life [6]. The incidence of NNJ is rising each year [7]. The significant downsides of NNJ were the development of kernicterus and acute bilirubin encephalopathy because of a severe level of bilirubin in the blood that crosses the blood-brain barrier [2], [8], [9]. These significant sequelae are preventable.

For this reason, identifying newborns at risk of developing severe hyperbilirubinemia and possible bilirubin-induced neurologic sequelae requires early detection as management of jaundice can be initiated as early as possible [4], [10]. Efforts were ongoing to address the development of practice parameters by the American Academy of Paediatrics (AAP). The pre-discharge risk-based assessment for subsequent hyperbilirubinemia has recently been introduced [10].

Notably, clinicians use qualitative or quantitative methods to estimate bilirubin levels to detect neonatal jaundice. Qualitatively, the clinician assesses the bilirubin level via visual assessment by comparing the jaundice level using Kramer's rule as a guide. This method is convenient and non-invasive; however, it provides unreliable estimates as its measurement can be affected by skin pigmentation and provide subjective interpretation due to inter-observer variation [12]. On the other hand, quantitative bilirubin measurement can be done in the laboratory through an automated analyser or point of care testing (POCT). Despite its invasiveness, total serum bilirubin (TSB) is the gold standard [10] for bilirubin measurement diagnostic and monitoring methods. This method requires frequent blood taking, which is unpleasant to neonates with difficult venepuncture [13].