



PULSE OXIMETRY AS SCREENING TEST FOR EARLY-ONSET SEPSIS IN NEWBORNS IN TERTIARY CARE HOSPITAL

Pediatrics

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ABSTRACT

Among the major causes Sepsis plays a crucial role in neonatal mortality. Recent studies have shown that hypoxemia, which is reduction of oxygen saturation in arterial blood is closely related to the neonatal infections. So by detecting these hypoxemic condition of the newborn in the initial few hours of birth by using pulse oximetry screening, there was reduction in neonatal mortality and neonatal morbidity rates. A Prospective Observational study research design was adopted for this study. All asymptomatic newborns born after 35 weeks gestational age were screened on two occasions using pulse oximetry. Newborns with oxygen saturations below predefined thresholds (reading below 90% or the repeat readings remained between 90 to 94%) were defined as test positive and all these babies underwent a septic screen which included full blood count, C-reactive protein, blood cultures and chest x-ray. Test negative newborns were followed up in the out patient department to ascertain if they were diagnosed to have sepsis in the first week. A total of 97 eligible newborns were screened. Four (4/97, 4.1%) newborns were tested positive and among them one baby had significant radiological abnormality. All test negative newborns were followed up and none had evidence of early onset sepsis at follow up. This study demonstrates that it is feasible to use pulse oximetry to screen for early onset sepsis in asymptomatic newborns

KEYWORDS

Newborn, Pulse oximetry, screening, early onset sepsis

INTRODUCTION

Hypoxemia during pulse oximetry screening of the newborns in the initial hours of the life gives an idea of newborns at risk. By pulse oximetry screening we can reduce the unnecessary expenditure incurred by septic work up. In remote areas where the availability of investigations are not feasible, pulse oximetry screening can be used to estimate the problem in the newborn. As the pulse oximetry screening is economical, this can be used in many places to assess the risk^{1,2}.

After the birth of the baby, the baby is subjected to a lot of stress in order to have a smooth transition from intra-uterine to extra-uterine life. The first few days of the post natal life are critical for the well being of the neonate. Unfortunately due to several causes the neonatal mortality is high in many parts of India. Among the major causes Sepsis plays a crucial role in neonatal mortality. Recent studies have shown that hypoxemia, which is reduction of oxygen saturation in arterial blood is closely related to the neonatal infections¹. Therefore, by detecting these hypoxemic conditions of the newborn in the initial few hours of birth by using pulse oximetry screening, there was reduction in neonatal mortality and neonatal morbidity rates³. The present study is aimed to study the effectiveness of pulse oximetry screening in diagnosing early onset sepsis in asymptomatic newborns.

MATERIALS AND METHODS

This prospective observation study was conducted in Department of Paediatrics, RL Jalappa Hospital and Research Centre, Kolar, Karnataka, India. The study has been approved by the Institutional Ethics Committee and informed consent was obtained from the parents. In this study, a total of 97 asymptomatic neonates born to pregnant women with gestational age of ≥ 35 weeks were included and studied. The sample size is estimated on (0.93%) positivity rate by pulse oximetry in a study conducted by Swamy et al⁴ with 95% confidence with absolute precision of 2%, the estimated sample size is 88. Considering a non compliance of 10% in the study, the final sample size would be 97. Newborns with symptoms and signs of sepsis prior to screening, and those admitted to the neonatal unit were excluded

Saturation of the right hand and either foot was noted within the first 12 hours of birth. The saturation was rechecked at 48 hours of life³. When the oxygen saturation in both the limbs was more than 94% and the difference between the limb reading is $< 3\%$, the newborn was deemed normoxaemic (test negative). When the saturation was between 90% and 94% in either limb or the difference between the limb readings was $\geq 3\%$, the screening test was repeated 1-2 hours later. When any reading

was below 90% or the second repeat readings remained 90 to 94% (or difference $\geq 3\%$) the newborn was deemed hypoxaemic (test positive). That baby underwent a clinical assessment and septic work up which included Complete Hemogram, C-reactive protein, blood culture, chest x-ray. Any newborn having a serum CRP more than 10 mg/dl or a positive blood culture or radiological signs of pneumonia on the chest x-ray were considered to have early onset sepsis.

STATISTICAL ANALYSIS

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Pie diagrams and Bar diagrams. Paired t test is the test of significance for paired quantitative data. p value of < 0.05 was considered as statistically significant.

RESULTS

The total number of cases included in the study were 97, out of which 52 (53.6%) were males and 45 (46.4%) were females. Among 97 babies, 24 (24.7%) babies were late preterm babies and 73 (75.3%) babies were term babies (Figure 1). A total of 4 babies screened (4.1%) had a positive pulse oximetry result out of whom 1 baby was late preterm baby and 3 babies were term babies. All the babies had saturations below 90% and were detected within 12 hours of birth. Among them 3 babies were male and 1 baby was female. These 4 babies underwent a septic work up which was consistent with sepsis (Figure 2). The CRP value was > 20 mg/dl in all the newborns. One neonate had radiological signs of pneumonia (Figure 3). Blood cultures were negative in all the neonates. The baby having significant radiological findings required respiratory support in the form of Continuous positive airway pressure till 2 days of life. All the 4 babies who were positively screened were started on Intravenous antibiotics. Follow up at one week was completed in all the test negative newborns and none had features of sepsis or required hospital admission

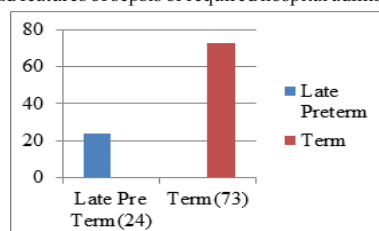


Figure 1: Distribution among Term and Late Preterm babies

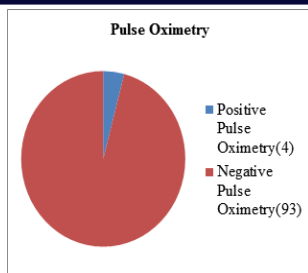


Figure 2: Results of Pulse oximetry

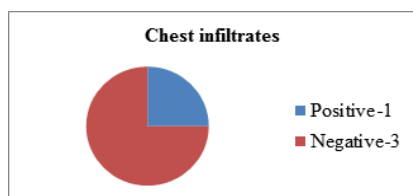


Figure 3: Showing X ray findings among positive Pulse oximetry results

DISCUSSION:

This study has demonstrated that pulse oximetry can be used as a screen for early onset sepsis in asymptomatic newborns. None of the test negative newborns had early onset Sepsis during follow-up. Although the sensitivity and specificity of pulse oximetry in detecting sepsis in this study is 100%, this should be interpreted with caution because only 4 newborns were tested positive. Worldwide, recent campaigns have concentrated on equipping all hospitals with this potentially life-saving equipment. Developing countries have mainly prioritized the role of pulse oximetry in sick newborns, and not as a screening tool in apparently healthy newborns.⁵

In a study conducted by Vida Jawin et al reported that pulse oximetry screening test was effective in identifying newborns with Critical congenital heart disease and other hypoxemia illnesses, which may lead to potential life-threatening condition and suggested that pulse oximetry has immediate implications for low- and middle-income countries to reduce neonatal mortality and morbidity.⁶

This study shows that using pulse oximetry as a screening method, detecting sepsis was feasible. It requires minimal training of the hospital staff and on an average about 5 minutes to complete the process of screening. This study may therefore help formulating guidelines on using pulse oximetry to rule out sepsis and form basis for future research.

CONCLUSION

The present study concludes that pulse oximetry may be used to screen early onset sepsis in asymptomatic newborns. Pulse oximetry is readily available and is portable. This study shows that pulse oximetry screening may be a potential tool to rule out early onset sepsis.

LIMITATION

The main limitation of the study was small sample size.

CONFLICT OF INTEREST: Nil

FUNDING: Nil

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