Section: Pediatrics

Original Research Article

A STUDY ON EFFECT OF A PERIPHERAL INTRAVENOUS LINE BUNDLE IN REDUCING THE INCIDENCE OF SEPSIS ASSOCIATED WITH PERIPHERAL INTRAVENOUS CANNULATION IN A TERTIARY CARE HOSPITAL

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Abstract

Background: The insertion of peripheral intravenous catheters (PIVC) is the most common invasive procedure followed in neonates admitted to Intensive care units, however, it is associated with many local and systemic complications. The efficacy of PIVC bundles in reducing blood stream infections is uncertain. The aim of this study is to evaluate the effectiveness of Peripheral intravenous cannulation insertion and maintenance on preventing blood stream infections. **Materials and Methods:** The study employed is a pre-post intervention design. Participants are the Neonates who are admitted in intensive care unit and requiring intravenous administration of IV fluids or antibiotics. Phase 1 is a retrospective calculation of 12 months of surveillance period as a baseline. Phase 2 is a multidisciplinary quality improvement intervention. In Phase 3 the results are evaluated and analyzed. **Result:** Primary outcomes: The post implementation PIVC bundle care incidence of sepsis was 5% compared to pre implementation incidence of 25%. PIVC associated bloodstream infection rate post implementation was 1.4%, compared to pre implementation rate of 21.65%. Secondary outcomes: Compliance to bundle approach is 100%. Phlebitis by visual inspection phlebitis score is 1(6.2%) and 0(93.75%). **Conclusion:** Our study demonstrated significant reduction in the incidence of blood stream infections following easy and simple practice of PIVC bundle care approach. These findings highlight importance of promoting Aseptic No Touch Technique to combat overall morbidity and mortality in neonates associated with blood stream infections.

INTRODUCTION

Insertion of PIVC is the most common invasive procedure among neonates admitted in hospital.[1] Yet PIVC complications (infiltration and extravasation, blockage, dislodgement, and phlebitis) result in premature access failure in up to 69% of hospital patients,[2] requiring the insertion of a new device, with delays in treatment and increased costs. Furthermore these venous catheters are associated with local and systemic complications like sepsis leading to increase length and cost of hospital stay.[2] There are studies regarding central line associated infections in neonates and decrease in its number when central line bundle was implemented.[3] However as need and use of PIVC is more common than central lines, we felt that this is a likely important source of blood stream infection.[4,5]

The introduction of care bundles that simplify lengthy guidelines into point-of-care reminders has improved staff compliance with best practice.[4] While the beneficial effect of Central venous line bundles is without doubt, particularly in ICU patients, PIVC bundles so far have not demonstrated similar success, primarily due to broad variability in bundle components.[6]

So in this study we intend to assess the effect of PIVC in decreasing the incidence of blood stream infections in neonates.

Aim

The aim of the study is to evaluate the effect of the peripheral intravenous cannulation care bundle in reducing the incidence of blood stream infections.

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Objectives:

1. To compare incidence of peripheral line associated blood stream infections in enrolled neonates pre and post implementation of peripheral intravenous cannulation care bundle
2. To assess the Compliance to the bundle approach (as measured by the proportions of peripheral cannulation enrolled where all components of the bundle were followed)
3. To assess Phlebitis by visual infusion phlebitis by a trained staff nurse in every shift

MATERIALS AND METHODS

The present study is a Cross-sectional Observational study conducted in Paediatric department of ASRAM hospital, ELURU during the period of 15th August 2021 to 15th March 2022. Neonates who were admitted in intensive care unit and requiring intravenous administration of IV fluids or antibiotics were selected during this study.

Inclusion Criteria: Neonates who were admitted in intensive care unit and requiring intravenous administration of IV fluids or antibiotics

Exclusion Criteria

1. Neonates being treated for sepsis at the time of admission or screen positive even before IV cannulation
2. Neonates in whom invasive procedure or venous sampling was done outside
3. Neonates in whom intravenous device is inserted outside
4. Neonates in whom > 2 cannulation attempts were required for IV access
5. Neonates concurrently present indwelling invasive devices/ central vascular catheter

Methodology

Data was collected according to the pre-designed proforma. Clinical profile was recorded at admission and babies were followed throughout the course of illness in the hospital and outcome was recorded. Immediate resuscitative measures were taken, and specific treatment was started and changed according to the course of baby in the hospital. Babies were followed daily till discharge/death to study the outcome.

The study was employed in 3 phases. In Phase one, that is Pre-intervention, a retrospective analysis of the surveillance records of 6 months from February 15th 2020 to August 15th 2021, was done to establish a baseline PVC associated bloodstream infection rate. In Phase two Prospective observational study with quality improvement multidisciplinary implementation was done from 16th August 2021 to 16th February 2022. In Phase 3 the results are evaluated and analyzed with the help of spreadsheet and Microsoft Excel.

Peripheral intravenous cannulation bundle care elements:

1. Aseptic no touch technique
2. Skin asepsis
3. Optimum catheter site selection
4. Peripheral intravenous cannulation set
5. Hub care
6. Using a transparent sterile semi-permeable dressing or sterile gauze to cover the insertion
7. Management of extension tube
8. Flushing
9. Training and education of Staff
10. Daily revision of peripheral line

Statistical Analysis: Data collected was entered in Microsoft Excel and analysis was done using SPSS version 20.0. Mean with SD was calculated for all continuous variables. Categorical variables were expressed as percentages (proportions). All categorical variables were compared in the pre and post implementation period using Chi squared test. Student t test and Wilcoxon signed rank test were used to compare continuous variables with the normal and skewed distribution respectively. Patient's privacy maintained by not publishing the identifying information.

RESULTS

Primary outcomes: The post implementation of PIVC care bundle incidence of sepsis was 5% [Figure 2] compared to pre implementation of PIVC care bundle incidence of 25% [Figure 1].

Peripheral Vein Cannulation associated bloodstream infection rate post implementation was 1.4% [Figure 3], compared to pre implementation rate of 21.65%.

Secondary Outcomes: Compliance to bundle approach is 100% [Figure 4].

Phlebitis by visual inspection phlebitis score is 1(6.2%) and 0(93.75%) [Figure 5].

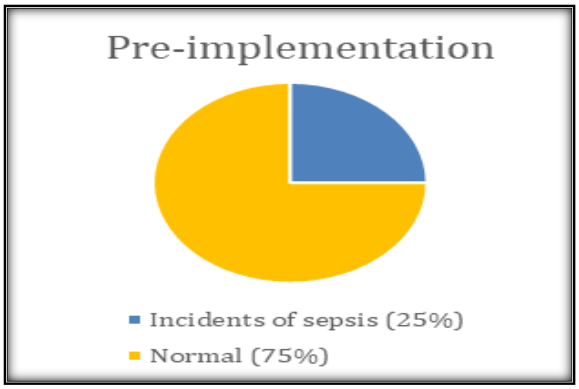

Figure 1

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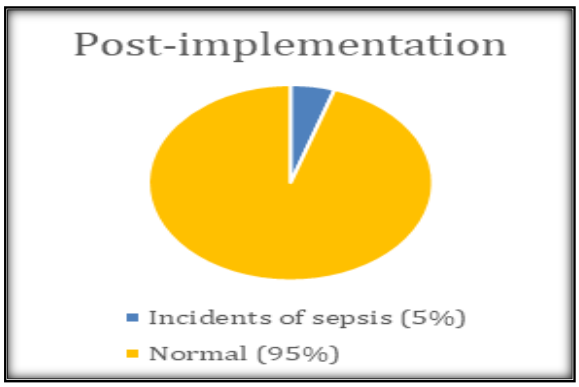

Figure 2

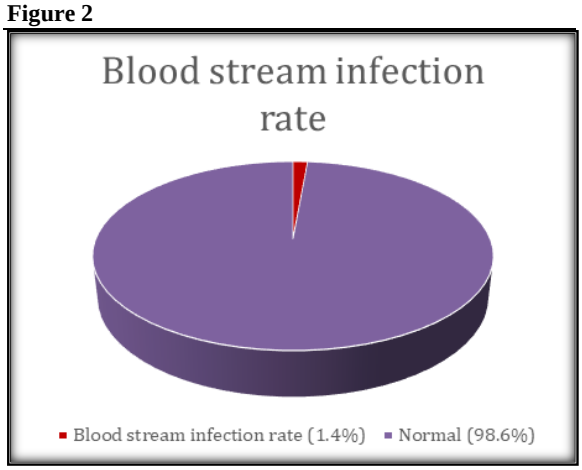

Figure 3

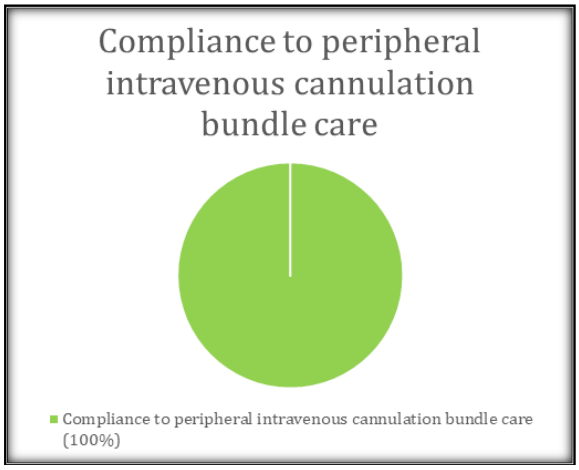

Figure 4

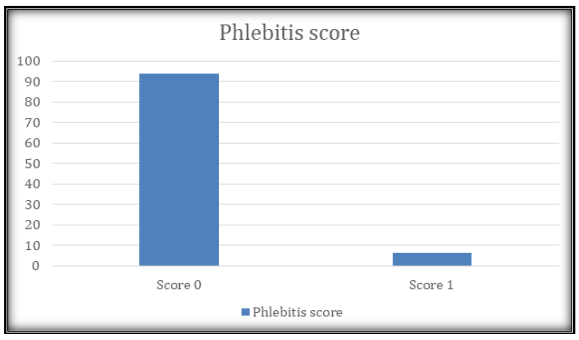

Figure 5

DISCUSSION

The present study is an Ambispective study where, the incidence of sepsis pre and post implementation of bundle care in PIVC was evaluated, in neonates admitted in Intensive care units.

The current study revealed that the incidence of blood stream infection was reduced to 5% after implementation of bundle care in comparison to 25% incidence in pre-implementation group, having a statistically significant p value($p<0.001$). In a similar study by Othman WN et al, 2017 the presence of microorganisms was 46.7% pre- implementation compared to 3.3% post implementation which was highly statistically significant ($P<0.001$).[7]

It was noted that in our study, the overall nurses and paediatric resident compliance with peripheral intravenous cannula care bundle improved significantly in all elements of insertion and ongoing care actions having 100% Compliance, which was in accordance with a study by Othman WN et al., 2017 which showed that the overall compliance regarding peripheral intravenous cannula care bundle was 70 % in both insertion and ongoing care actions post-education, which was significantly improved compared to pre-education.[8]

In our study the inflammation at cannula site was significantly decreased post care bundle education ($P<0.001$). This agrees with meta analysis done by Luyu Lv et al, 2020 where the incidence of phlebitis was higher in non-intervened (30% (95% confidence interval: 27%, 33%)) than in intervened groups (21% (95% confidence interval: 15%, 27%).[9]

Limitations: The limitations to the study was small study population and observer variability.

CONCLUSION

Our findings have implications for clinical practice.

The study demonstrated that there is significant reduction in the incidence of blood stream infections by following easy and simple practice of peripheral intravenous cannulation bundle care approach in the most common procedure practiced in Intensive unit care.

These findings help in promoting aseptic no touch technique approach which would reduce the overall morbidity and mortality in neonates associated with blood stream infections.

The overall length of hospital stay and health care cost is also reduced.

We hope the findings provide useful guidance for policy makers and healthcare clinicians interested in implementing an evidence-based PIVC bundle.

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