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Serious Bacterial Infection Detection by Marker Procalcitonin in Young Febrile Infants

KEYWORDS: Procalcitonin, Bacterial Infection, White blood cells, biomarker, febrile

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ABSTRACT ***Aim and Objectives:*** *The aim is the analysis of serum procalcitonin (PCT) to predict bacterial infection in young infants. There is no perfectly sensitive or specific test for identifying young, febrile infants and children with occult serious bacterial infections (SBIs). Studies of procalcitonin (PCT), a 116-amino-acid precursor of the hormone calcitonin, have demonstrated its potential as an acute-phase biomarker for SBI.* ***Materials & Methods****: In this study, 100 cases of febrile infants with age less than 3 months were taken. Study was done in paediatrics department of JLNMCH, Bhagalpur, Bihar from January 2015 to January 2016. All cases were registered fulfilled the inclusion criteria. This study was done to see the role of procalcitonin in detection of serious bacterial infection in infants.* ***Results****: The test included of the PCT levels, white blood cell (WBC) counts including neutrophil for identifying SBI. Seventy two (72%) children had SBIs. Fifteen (15%) had bacteremia, 10(10.0%) had urinary tract infections (UTIs), and three (3%) had pneumonia. Children with SBIs had higher PCT level, higher absolute neutrophil counts and higher WBC levels than those without SBIs.* ***Conclusions****: Procalcitonin is a more accurate biomarker than traditional screening tests for identifying young febrile infants and children with serious SBIs. Further study on a larger cohort of young febrile children is required to definitively determine the benefit of PCT over traditional laboratory screening tests for SBIs.*

Introduction-

The prevalence of bacterial infections in febrile infants younger than 90 days is 5%–15%. Urinary tract infections (UTIs) are the most common, but invasive bacterial infections (IBIs) such as bacteremia and meningitis are the most concerning and are difficult to diagnose because of the lack of reliable clinical signs and symptoms in young infants. Therefore, combining clinical observations with select laboratory screening tests is the best method for identifying infants at risk for UTIs or IBIs. Fever is a common symptom in children younger than 3 years of age presenting to the emergency department (ED). Most children with fever without source will have nonbacterial causes of fever that will resolve without intervention. Some febrile children, however, will have occult serious bacterial infections (SBIs) such as bacteremia, urinary tract infections (UTIs), bacterial meningitis, lobar pneumonia, or bacterial enteritis. Because several investigations have demonstrated that the clinical examination by itself is not a reliable method to identify children with SBIs, clinicians depend on various risk stratification strategies that use screening laboratory tests. For the youngest infants, those younger than 3 months, three commonly used strategies include the Rochester, Philadelphia, and Boston screening criteria. For infants 3 months to 36 months of age, other screening strategies have been used, although the use, accuracy, and reliability of these screening methods have changed since the introduction of the conjugate pneumococcal vaccine. Although the screening strategies for both younger and older infants aim to identify most children with SBIs, the economic costs and effect on clinical efficiency of extensive routine laboratory evaluation, including potential iatrogenic morbidity, have been debated to a great extent. As of yet, there is no perfectly sensitive or specific test for identifying young, febrile children with occult SBIs, although several research studies and reviews have suggested the addition of specific biomarkers procalcitonin, including C-reactive protein (CRP) and interleukins (ILs; IL-6, IL-1, and IL-8) to routine screening tests in young febrile children. Much research has focused on evaluating screening tests and biomarkers that would allow the clinician to reliably and efficiently discriminate febrile children with occult SBIs from those with viral infections. Studies of procalcitonin (PCT), a 116-amino-acid precursor of the hormone calcitonin, have demonstrated its potential as an acute-phase biomarker for SBI.

Materials & Methods:

In this study, 100 cases of febrile infants with age less than 3 months were taken. Study was done in paediatrics department of JLNMCH, Bhagalpur, Bihar from January 2015 to January 2016. All cases were registered fulfilled the inclusion criteria. This study was done to see the role of procalcitonin in detection of serious bacterial infection in infants. The SBI group included infants with: (1) bacteraemia; (2) bacterial meningitis; (3) sepsis,; (4) urinary tract infection; (5) pneumonia; (6) bacterial gastroenteritis; or (7) cellulitis. Infants with negative cultures or with improvement despite no antibiotic treatment were included in the non-SBI group.

Results:

The test included of the PCT levels, white blood cell (WBC) counts including neutrophil for identifying SBI. The mean duration of fever at the time of diagnosis was 2days. Blood cultures, urine cultures, CSF cultures, leucocyte and neutrophil counts and PCT were analysed in all patients. Seventy two (72%) children had SBIs. Fifteen (15%) had bacteremia, 10(10.0%) had urinary tract infections (UTIs), and three (3%) had pneumonia. Children with SBIs had higher PCT level, higher absolute neutrophil counts and higher WBC levels than those without SBIs.

Discussion-

In this study, we found that the serum PCT was superior to traditional laboratory screening tests for detecting SBIs in febrile infants. In the study young age, the absolute neutrophil and WBC count, and PCT were all independently associated with SBI. The incidence of SBI is higher in younger febrile infants compared to older febrile children, consistent with prior research. PCT appears to be more accurate as a screening test for SBI than other traditional

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blood screening tests. The management of febrile infants under 3 months of age is based on clinical scales that aim to define a group at low risk of presenting SBI and thus to reduce unnecessary hospital admissions and use of antibiotics. Several studies have investigated the predictive factors of SBI in this age range but few have included CRP and, in particular, PCT for this diagnosis after the neonatal period. Gajdos et al20 studied the predictive factors of SBI in a group of febrile infants under 3 months of age and found that, of the factors studied, only an elevated leucocyte count with .50% neutrophils and a CRP valu.20 mg/l were able to predict SBI, with an NPV of 93%. Maniaci et al,21 in a recent study focused on PCT in febrile infants aged ,90 days old, demonstrated that PCT may be a useful marker for SBI in young febrile infants. The authors reported a ROC AUC of 0.76 for definite and possible SBI, that is, better than that of leucocyte or neutrophil count. The optimal cut-off value used was 0.12, lower than in other studies with a sensitivity of 95.2% and NPV of 96.1% but at the expense of a lower specificity. The availability of a biomarker that could accurately and rapidly identify SBI in febrile infants and children without obvious source would frequently obviate the need for invasive procedures such as lumbar punctures and reduce the use of empirical antibiotics and hospitalization and would be of significant importance to patients, their families, and clinicians.

Conclusions: Procalcitonin is a more accurate biomarker than traditional screening tests for identifying young febrile infants and children with serious SBIs. Further study on a larger cohort of young febrile children is required to definitively determine the benefit of PCT over traditional laboratory screening tests for SBIs.

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