

Urinary Neutrophil Gelatinase Associated Lipocalin for Early UTI Diagnosis

Maheer S Shalabi¹, Osama Y Safdar^{1*}, Mohammed A Shalaby¹ and Alanoud A Turki²

¹Pediatric Department, Faculty of medicine, King Abdulaziz University, Jeddah, Saudi Arabia

²College of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

*Corresponding author: Osama Y Safdar, Pediatric department, King Abdulziz University Hospital, Jeddah, Saudi Arabia; E-mail: safderosama@hotmail.com

Received date: Nov 26, 2015, Accepted date: Feb 09, 2016, Published date: Feb 17, 2016

Copyright: © 2016 Shalabi MS, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Urinary tract infection (UTI) is common in pediatric age group [1]. Delay in the management of UTI can lead to medical complications including: renal scarring, hypertension and chronic kidney disease and this indicate the importance of early diagnosis so the medical treatment can start at an appropriate time [2]. While urine culture is the golden standard for UTI diagnosis; however it can take 2-4 days to have culture results. Urine dipstick is an easy and available test but its sensitivity and specificity for UTI diagnosis is 70 to 80% at most. Because of the above mentioned factors the need for diagnostic biomarker that can lead to early UTI diagnosis emerging nowadays many biomarkers have been discovered recently aiming for early UTI diagnosis including procalcitonin, cystatin C and Neutrophil gelatinase associated lipocalin (NGAL). The results of these biomarkers are conflicting and their ability for prediction of vesicoureteral reflux and renal scarring still needs more studies with long term follow up lack of multicenter and use if different cut-off value.

The Neutrophil gelatinase associated lipocalin (NGAL). The NGAL is a small protein (25 kDa) and a member of lipocalin superfamily found in the granules of neutrophils and is a constituent of the innate immune system [3]. It is released early from the renal tubular cells with regards to insults on the kidney; inflammation, infections and ischemia. NGAL can be measured in the serum or urine. It is measured using the enzyme-linked immunosorbent assay (ELISA) technique within four hours.

Urinary NGAL was first studied as marker to diagnose acute kidney injury (AKI) and several studies indicate that it has a good predictive ability to diagnose AKI in critically ill patients [4]. Recent studies from Korea [5] and Turkey [6] showed that NGAL might be a good marker for UTI diagnosis but studies suffer from small number of patients.

In King Abdulaziz University Hospital we recruited 73 febrile children. Those eligible for inclusion were febrile children with a temperature of $>38^{\circ}\text{C}$ in the emergency or pediatric ward at King AbdulAziz University Hospital in Jeddah-Saudi Arabia Ages (0-14 years) who were clinically assessed by a physician and suspected of having a UTI for example; as fever, vomiting, and decreased oral intake.. The study duration was three months, from June-August 2014 [7].

Exclusion criteria

Children with acute kidney injury or known stage 3 kidney disease with a glomerular filtration rate (GFR) $<60\text{ ml/min/1.73 m}^2$ or with acute kidney injury or already diagnosed with urinary tract infections were excluded from the study.

Method

After consents were taken from the parents, urine samples using age-appropriate methods and tested Urine samples for culture and sensitivity and NGAL were obtained using catheter in infants and midstream urine in older age groups.

Urine samples were stored in the refrigerator and urinary NGAL levels were measured by using a NORMAN-2 scattering turbidimetric analyzer; the measurable range was 0 to 4,000 ng/ml.

Blood samples were taken for measuring C-reactive protein (CRP), hemoglobin (HGB), white blood cells (WBCs), platelets, creatinine, blood culture and sensitivity (C&S).

A UTI was diagnosed when patients presented with pyuria (≥ 5 WBCs/HPF) and positive urine culture (pure growth of 105 organism/ml).

After obtaining appropriate consent, urine sample was obtained for measuring NGAL. We aim to test the ability of urinary NAGL to diagnose UTI. out of 73 patients, 31 were diagnosed with UTIs, and 42 did not have UTIs (control group). There were 33 male and 40 female patients. The mean age of the patients with UTIs was 25 months, and the mean age of patients without UTIs was 27.3 months. By using receiver operating characteristic curve, Urinary NGAL sensitivity is 59% and specificity is 68% by using cut-off value of 35.83 ng/ml. This indicates that urinary NGAL might not be a good marker for UTI diagnosis in febrile children. However more studies from multicenter and larger number of patients are needed to verify the role of NGAL in UTI diagnosis.

References

1. Montini G, Tullus K, Hewitt I (2011) Febrile urinary tract infections in children. *N Engl J Med.*; 365: 239-250.
2. White B (2011) Diagnosis and treatment of urinary tract infections in children. *Am Fam Physician* 83: 409-415.
3. Kjeldsen L, Bainton DF, Sengelov H, Borregaard N (1993) Structural and functional heterogeneity among peroxidase-negative granules in human neutrophils: identification of a distinct gelatinase-containing granule subset by combined immunocytochemistry and subcellular fractionation. *Blood* 82: 3183-3191.
4. Devarajan P (2010) Review: neutrophil gelatinase-associated lipocalin: a troponin-like biomarker for human acute kidney injury. *Nephrology (Carlton)* 15: 419-428.
5. Seo WH, Nam SW, Lee EH, Je BK, Yim HE, et al. (2014) A rapid plasma neutrophil gelatinase-associated lipocalin assay for diagnosis of acute pyelonephritis in infants with acute febrile urinary tract infections: a preliminary study. *Eur J Pediatr* 173: 229-232.
6. Yilmaz A, Sevketoglu E, Gedikbasi A, Karyagar S, Kiyak A, et al. (2009) Early prediction of urinary tract infection with urinary neutrophil gelatinase associated lipocalin. *Pediatr Nephrol* 24: 2387-2392.

7. Safdar OY, Shalaby M, Toffaha WM, Turki AA, Toffaha WM, et al. (2015) Neutrophil Gelatinase-Associated Lipocalin as an Early Marker for the Diagnosis of Urinary Tract Infections in Saudi Children. J Nephrol Ther 5: 221.