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Early Detection of Bacteriuria in a Sample of School Children Using Simple Screening Tests

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" قالوا سبحانك لا علم لنا إلا ما
علمتنا إنك أنت العليم الحكيم "

(سورة البقرة (32)

" وأن ليسَ للإنسانِ إلاَ ما سعَى وأن
سعَيهَ سوف يُرى ثم يجُزيه الجَزَاءَ
الأوفَى وأن الِى ربك المنتَهى ".

(سورة النجم (39 - 40- 41)

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LIST OF ABBREVIATIONS

ABU	Asymptomatic Bacteriuria
CFU	Colony Forming Units
Coagulase +ve staphylococci	Coagulase Positive Staphylococci
CRP	C Reactive Protein
DMSA	Dimercaptosuccinic Acid
E.coli	Escherichia Coli
HPF	High Power Field
HS	Highly Significant
IL-8	Interleukin 8
IV Therapy	Intravenous Therapy
Klebsiella sp	Klebsiella Species
NS	Non Significant
P	Propability
PCT	Serum Procalcitonin
Pseudomonus sp	Pseudomonus Species
S	Significant
sIgA	Secretory Immunoglobulin A
UTI	Urinary Tract Infection
VCUG	Voiding Cystourethrogram
VUR	Vesicoureteral Reflux
X^2	Chi-square

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Abstract

This study was a cross-sectional study conducted on a sample of 350 Egyptian school children; 174 males and 176 females, aged (11-17) years with a mean of 14 ± 1.7, in the area of Heliopolis, Cairo. The aim of the study was to assess the prevalence of bacteriuria among these pupils and to determine the validity of simple screening tests as rapid diagnostic tests compared to standard urine culture.

All pupils were subjected to complete history taking and clinical examination that included general and local abdominal examination. Detailed methods of collecting midstream urine specimens were explained to the pupils. A urine sample was obtained from each pupil in a sterile disposable container and was subjected to: quantitative culture, conventional culture, microscopic examination and screening tests for infection using dipstick for nitrite and leukocytes.

Results of the present study showed that 27 out of 350 urine specimens were positive for significant bacteriuria, the prevalence of bacteriuria was (7.7%). Twenty one out of 350 urine specimens were positive for asymptomatic bacteriuria by culture with a prevalence of (6%), while 6 out of 350 urine specimens were positive for symptomatic bacteriuria with the prevalence of (1.7%). A statistically highly significant difference was noticed in the incidence of significant bacteriuria between females and males with predominance in females ($P< 0.01$). As regards the bacterial isolates in cases of significant bacteriuria,

they were found to be Coagulase positive staphylococci (55.6%), E.coli (11.1%), Klebsiella species (11.1%), Proteus (11.1%), Pseudomonus species (7.4%) and Enterococcus faecalis (3.7%). A statistically significant difference was noticed when comparing between two age groups (11-14 years versus 15-17 years) with predominance of significant bacteriuria at the age of (11-14) years ($P< 0.05$). As regards the validity of simple screening tests as rapid diagnostic tests it was found that sensitivity of nitrite test was (33.3%) and its specificity was (95.7%) while sensitivity of leukocyte esterase test was (11.1%) and its specificity was (99.7%).

It is concluded that significant bacteriuria is a current problem in adolescence especially in females. The most common organisms are Coagulase positive staphylococci, followed by Escherichia coli, Klebsiella species, Proteus, Pseudomonus species and Enterococcus faecalis. Asymptomatic bacteriuria should be screened by using urine dipstick for nitrite and leukocytes, which is useful and commonly used because of its rapidity and low cost, however its diagnostic accuracy is debatable, and must be confirmed by urine culture.

Aim of the study

The aim of the study was to assess the prevalence of bacteriuria in a sample of school children in the area of Heliopolis, Cairo.

An additional aim was to determine the validity of simple screening tests as rapid diagnostic tests in a sample of school children compared to standard urine culture.

Introduction

Urinary tract infections are a common cause of morbidity in children. The distinction between upper and lower urinary tract infection is clinically difficult but important, as permanent renal damage can occur when the urinary tract infection involves the kidney. Children with a history of urinary tract infection need to be investigated promptly and thoroughly ***(Paterson, 2004).***

The term bacteriuria refers to the presence of bacteria in urine. It implies that these bacteria are from the urinary tract and not contaminants from the vagina. The term includes renal and bladder bacteriuria. Bacteriuria can occur with or without pyuria. Significant bacteriuria is defined as the presence of 100.000 or more of the same organism per ml of midstream urine sample ***(Rao, etal., 2001).***

Asymptomatic bacteriuria is a common medical condition. It was defined as the presence of ³ 10^5 colony-forming units/ml without symptoms of urinary tract infection. Observation of patients with asymptomatic bacteriuria is reasonable when the patient is healthy and has normal voiding habits. However asymptomatic bacteriuria diagnosed for the first time should be evaluated and treated as a urinary tract infection because it may identify children at risk for recurrent infection and renal scarring ***(Rozsia, et al., 2003).***

Urinary tract infection is a common cause of serious bacterial infection in young children. The routine performance of urine analysis, urine culture, or both during subsequent febrile

illness in all children with a previous febrile urinary tract infection will propably obviate the need to obtain either early or late scan ***(Hoberman, et al., 2003).***

Diagnosis of urinary tract infection in children is dependent on the collection of uncontaminated freshly voided urine sample, which is key to the future management and follow-up of these patients. Prevention of possible long term renal damage remains a priority ***(Poole, 2002).***

There are several rapid tests for the detection of urinary tract infection in children. These include nitrite and leukocyte esterase dipstick tests. Such tests can be used to exclude a urinary tract infection when clinical symptoms are absent, especially if they are used, correctly. Although dipstick is a good method for screening of urinary tract infection it must be confirmed by urine culture ***(Latorre, etal., 2001).***

Secretory immunoglobulin A (sIgA): Urinary secretory immunoglobulin A, an immunoglobulin synthesized locally in mucosal surface is an important immunological defense in preventing bacterial adherence to periurethral epithelia and uroepithelia. Children with urinary tract infection show highly elevated levels of sIgA. The presence of sIgA is not only correlated with the UTI in children as well as in adults but sIgA seems to be directed to the infective agent and can also be used to identify the type of infection. Thus measurement of urine antibody levels may provide an alternative marker of host responses to infection, which can be used either as simple screening test or could be useful to assist alongwith other tests in establishing a diagnosis ***(Deo and Vaidya, 2004).***

The routine performance of urine analysis, urine culture, or both during subsequent febrile illness in all children with a previous febrile urinary tract infection will probably obviate the need to obtain either early or late scans ***(Hoberman, et al., 2003).***

* Evaluation :

The trend is towards early and thorough evaluation of infants and children with a culture-documented UTI. Clinical studies have shown that renal scarring may occur following a single UTI and that scarring is influenced by the number of pyelonephritic episodes. In fact, significant renal scarring already may be present at evaluation of what is believed to be a child's first UTI. This suggests that it may be difficult to know whether a

UTI truly is a child's first episode, especially in infants and toddlers, who have nonspecific symptoms ***(Paterson, 2004).***

A carefully taken history that includes a voiding history in toilet-trained children should be obtained early in evaluation of UTI. Identification and management of children with underlying voiding dysfunction are critical to prevent UTIs ***(Mazzola, et al., 2003).***

Physical examination should include an abdominal examination to identity flank masses, bladder distension or abdominal mass caused by fecal impaction. A brief neurological examination should include examination of the low back to exclude sacral dimpling or cutaneous abnormalities suggestive of an underlying spinal abnormality ***(Bartkowski, ,2001).***

Examination of the male genitalia should identify the circumcision status because uncircumcised infants and toddlers are at increased risk of UTI. In girls, identification of vulvovaginitis or labial adhesions might identify those predisposed to perineal bacterial colonization. Rectal examination to exclude fecal impaction is indicated if the history suggests severe constipation or encopresis ***(Chase, et al., 2004).***

Radiographic evaluation that includes imaging of both the upper and lower urinary tract should be performed after the first culture-documented UTI. Ultrasonography is an excellent noninvasive method to detect occult congenital anomalies that cause urinary tract obstruction. Imaging of the kidneys and bladder may identity common anomalies such as ureteropelvic