The sensitivity of urine microscopy in the diagnosis of urinary tract infection in children below 5 years.

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Abstract

Urinary tract infection (UTI) is a serious bacterial infection in children. if not diagnosed early & treated promptly may lead to renal scaring, hypertension or end-stage renal disease This study was conducted to assess the sensitivity of urine microscopy in the diagnosis of (UTI) and whether the sensitivity varies with the age of the patient Four hundred sixty cases were studied, selected according to certain criteria The study showed no significant sex preponderance in infantile age group while female predominate beyond infancy in a ratio of 2.4 :1The sensitivity of urine microscopy varies with age, it was (25.6%) in first 8 weeks of life, (53.1%) in age group 2 month – 1 year and (69%) in age group 1-5 years 1 concluded from this study that urine microscopy alone is not enough for the diagnosis of (UTI) & if we depend on it alone we will miss many cases of (UTI). To improve the sensitivity of urine microscopy, we can add dipstick examination of urine (WBC esterase & nitrite tests) & gram stain of unspun urine for bacteria.

الخلاصة

التهاب المجاري البولية مرض جرثومي خطير يصيب الأطفال، إذا لم يُشخص مبكراً ويعالج بصورة صحيحة قد يؤدي إلى مضاعفات خطيرة مثل تليف الكلية أو ارتفاع ضغط الدم أو عجز الكليتين هذه الدراسة أجريت لتقدير حساسية الفحص المجهري للإدرار في تشخيص التهاب المجاري البولية وفيما إذا لو كانت الحساسية تتغير حسب عمر المريض أربعمائة وستون حالة دُرست، تم اختيارها حسب مواصفات معينة. الدراسة أظهرت عدم وجود فرق ملحوظ بين الجنسين في السنة الأولى من العمر بينما الإصابة أكثر في الإناث بعد عمر السنة بنسبة 2.4 :1. حساسية الفحص المجهري للإدرار تختلف حسب عمر المريض وكانت (25.6%) في الشهرين الأولين من العمر، (53.1%) في الفئة العمرية من 2 شهر –1 سنة وكانت (69%) في الفئة العمرية 1–5سنة ستنتج من لبحث إن الفحص المجهري للإدرار غير كاف في تشخيص التهاب المجاري البولية و إذا اعتمدنا عليه لوحده فسوف نعجز عن تشخيص حالات كثيرة لتحسين حساسية الفحص المجهري للإدرار يمكن إضافة فحص استريز الكريات البيضاء والنايترايت وصبغة كرام للإدرار للكشف عن البكتريا.

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Introduction

Urinary Tract Infections (UTIs) are the most common source of serious bacterial infection in young children. Over all 3% to 5% of young febrile children have (UTIs).[1]

Approximately 3-5%of girls and 1% of boys acquire a (UTI). In girls, the average at the first diagnosis is 3 years, in boys, most(UTIs) occur during the first year of life.

To make the diagnosis of a (UTI), the urine must be cultured. A (UTI) may be suspected based on the symptoms or findings on urinalysis or both, but a culture is necessary for confirmation and appropriate therapy.[2]

Although the finding of pyuria is a good supportive evidence of (UTI), up to 50% of patients with significant bacteruria will not demonstrate significant number of white cells (more than 5 white cells per high power field) in the centrifuged urine specimen.

A recent study confirmed that pyuria may occur in 9% of febrile children without a (UTI).[3]

(UTIs) have been considered as important risk factor for the development of renal insufficiency or end stage renal disease.

If the child is asymptomatic and the urinalysis result is normal, it is unlikely that the urine is infected. However if the child is symptomatic, a (UTI) is possible, even if the urinalysis result is negative.[2]

(UTI) recurs at least once in about 20% of boys and 30% of girls, and more than once in about 4% of boys and 8% of girls.[4]

Pediatrician may miss a (UTI) if he accept a negative urinalysis result as sufficient evidence that a culture is not needed.

Prompt diagnosis & rapid treatment of (UTI) with antimicrobials will reverse acute changes and may limit future complications.[5][6][7]

I undertook this study to measure the sensitivity of the standard urine microscopy for detecting (UTI) and to determine if sensitivity varies with the age of the patients.

Patients and methods

five hundred thirty nine patients studied after admission to Kerbala hospital for children during the period from January 2000 - January 2003.

All the patients should have the following criteria to be included in the study

1. Age less than 5 years
2. No antibiotics were given to the patients prior to admission.
3. No definite source of fever by examination (bronchiolitis, stomatitis, cellulites, otitis media.... etc)
4. Fever $\geq 38^{\circ}$c with one or more of the following signs & symptoms, in infancy, prolonged jaundice, poor feeding, failure to thrive, vomiting, diarrhea or severe systemic illness while in children the signs & symptoms were more

specific like

dysuria, frequency, urgency, nocturia, haematuria, cloudy or foul smelling urine, suprapubic discomfort or tenderness & secondary incontinence After full detailed history & complete physical examination, blood was taken for complete blood picture & urine was collected by adhesive urine bag or clean catch mid-stream urine into sterile tube after proper cleaning of the perineum with a gauze moistened with water.

The urine samples were sent immediately to the lab. for urine microscopy & culture processing Urine microscopy considered positive if it shows 5 white blood cells or more per high power field (magnification x40) on spun specimen (centrifuged at 2000 rpm for 5 minutes Cultures were considered contaminated if more than one organism or non pathogens (Acinetobacter species, Candida, Streptococcus viridians, Staphylococcus non aureus.... etc) were isolated cases with contaminated or negative cultures were excluded from the study.

Results

Five hundred thirty nine patients were included in the study first, 79 patients were excluded later on, 40 patients due to contaminated cultures while the other 39 patients because of negative cultures results.

The target of my study were 460 patients, classified into 3 groups according to their

Group I

Age of patients form birth – 2 months Number of patients 43 (9.53%) of total cases Males were 23 patients (53.5%) Females were 20 patients (46.5%) negative urine microscopy were found in 32 patients (74.4%) positive urine microscopy were found in 11 patients (25.6%)

The micro-organisms which were isolated from the cultures shown in table (1)

Table (1)

Micro-organism	Number of patients	Percent
E.coli	35	81.39%
Enterobacter	5	11.62%
Pseudomonas	2	4.65%
Staph.aureus	1	2.32%

Group II

Age of patients 2 months – 1 year Number of patients 256 (55.65%) of total cases Males were 140 patients (54.7%) Females were 116 patients (45.3%) Negative urine microscopy were found in 120 patients (46.9%) Positive urine microscopy were found in 136 patients (53.1%)

The micro-organisms which were isolated from the cultures shown in table (2)

Table (2)

Micro-organisms	Number of patients	percent
E.coli	191	74.03%
Enterobacter	34	13.17%
Pseudomonas	12	4.65%
Proteus	9	3.48%
Staph.aureus	6	2.32%
Strept.	4	1.55%

Group III

Age of patients 1 – 5 years Number of patients 161 (35%) of total cases Males were 47 patients (29.2%) Females were 114 patients (70.8%) Male: female ratio 1: 2.42 Negative urine microscopy were found in 50 patients (31%) Positive urine microscopy were found in 111 patients (69%)

The micro-organisms which were isolated from cultures shown in table (3)

Table (3)

Micro-organism	Number of patients	percent
E.coli	128	79.50%
Enterobacter	10	6.21%
Proteus	9	5.59%
Staph.aureus	8	4.96%
Pseudomonas	5	3.10%
Strept.	1	0.62%

Considering all patients from birth – 5 years regardless of age group, urinalysis were negative in 203 patients (44%) & positive in 257 patients (56%), i.e. the sensitivity is (56%) as a whole for all patients.

Table (4)

Age group	Sensitivity
Group I (0 – 2 months)	25.6%
Group II (2 month – 1 year)	53.1%
Group III (1 – 5 years)	69%
All patients	56%

Discussion

Male to female ratio in the first year in this study showed slight male preponderance while after infancy female predominate 2.4 : 1. In other studies male to female ratio was 2.8 – 5.4 : 1 during first year of life & there is a striking female preponderance beyond infancy 10 : 1.[(2)][(8)][(9)] The sensitivity of urine microscopy (pyuria > 5 while blood cells per high power field) was (25.6%) in patients below 2 months, (53%) in patients between 2 months – 1year & (69%) in patients 1-5 years old

Hoberman [(10)] found a sensitivity of (54%) for pyuria (> 5 WBC per high power field) in febrile infants younger than 1 year, which is similar to this study Grain & Gershel [(9)] found the sensitivity of urinalysis (pyuria & bacteruria) to be (48%) among infants younger than 8 weeks which is higher than the figure in this study because they combine pyuria & bacteruria while in this study I depend on pyuria alone.

Grain and Gershel presented data indicating that in the first 8 weeks of life, a positive urinalysis does not necessarily indicate (UTI) and a negative urinalysis does not rule out (UTI).

In this study the sensitivity of pyuria varied with age group as shown in table (4) while in other studies it was constant with age groups.[(11)][(12)][(13)] In this study we use adhesive urine bags for children less than 2 years & clean–catch mid-stream urine sample for children beyond 2 years. Published data suggest that (85%) of the time, a positive culture result in a bag-collected specimen is likely to be false-positive.[(14)] However Newman & colleagues did not find an excess of positive urine culture among infants whose urine was collected in a bag if performed adequately, if such factors are considered (the time between voiding and removal of the bag from the perineum and between specimen collection & refrigeration or processing).[(15)]

Thirty nine patients had symptoms related to urinary system but had negative urine culture which could be due to a non-(UTI) cause such as vaginitis, uretheritis or pinworms.[(16)] The micro-organisms isolated from urine cultures in this study were more or less similar to other literatures.[(3)][(17)]

Conclusion

Prompt diagnosis & rapid treatment of (UTI) with antimicrobials will reverse acute changes & may limit future complications like renal scaring, hypertension & renal failure.

The sensitivity of urine microscopy in this study in diagnosing (UTI) was (31-69%) so we may miss many cases of (UTI) if we depend on urine microscopy alone.

To improve the sensitivity to around (88%) we can use dipstick (leukocyte esterase & nitrite) and microscopy.[(18)]

Moreover the sensitivity can be increased to 94% if gram stain of unspun urine for bacteria is used.[(19)]

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