

Bacteriuria in Children

Pages with reference to book, From 197 To 202

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Abstract

A total of 231 hospitalised children were studied for bacteriuria; they were divided into symptomatic and asymptomatic groups. The cases with significant bacteriuria (10^5 organisms/ml of urine) only were considered positive. Five percent of the total cases had significant bacteriuria, a large majority of them being girls. In the symptomatic group the frequency of UTI was 6% while in the asymptomatic group it was 2.7 %. The organisms isolated were E. Coli, Kiebsiella, Micrococci, Staph. albus and Enterobacter aerogenese. Most of them were sensitive to kanamycin, gentamycin, nitrofurantoin, nalidixic acid and cephaloridines (JPMA 33:197, 1983).

Introduction

Urinary tract infections (UTI) are common in children, but are often overlooked due to their vague symptomatology especially in infants and young children. Pyuria may also be absent in UTI and the diagnosis is missed on routine testing. Many infections particularly chronic ones, remain asymptomatic. Hence the diagnosis of UTI just on clinical grounds is unreliable. Conversely sometimes in children typical symptoms, notably frequency and dysuria are unaccompanied by infected urine. Some of these presenting as pyrexia are often treated as PUO and their management is likely to remain inadequate without proper diagnosis.

Untreated or inadequately treated UTI may lead to progressive loss of renal function. Chronic UTI can lead to distortion and scarring of the kidneys. It has been shown that most caoes of chronic pyelonephritis in young adults start in childhood. It is therefore necessary to diagnose cases of UTI as early as possible in childhood and to treat them properly. Congenital structural abnormalities of the urinary tract are known to be associated with UTI and thepresence of significant bacteriuria might be the first clue of their presence.

Diagnostic importance of counting the bacteria in urine has been established for detection of UTI (1). Now it is widely accepted that bacterial count in excess of 100,000/ ml of urine is indicative of UTI (2) and this is termed "significant Bacteriuria". The proper diagnosis of UTI therefore can only be based on bacteriological findings.

There are oniy few reports available in ow country on the incidence and prevalence of UTI in children.

Material and Methods

The study was conducted in the department of Paediatrics, Rawaipindi General Hospital, Rawalpindi. The bacteriological studies were carried out in the laboratory attached to the paediatric department where facilities for bacteriological culture and urinalysis were available. All children admitted to the ward between March and June 1979 were included in the study.

They were divided into two groups, (a) symptomatic group with symptoms relating to and suggestive of urinary tract infections and (b) asymptomatic group with symptoms not suggestive of urinary tract involvement.

Collection of Urine Specimen

A mid-stream catch specimen of urine was collected from every patient on admission, in a sterile,

screw capped, heat resistant plastic container, by a trained nurse. In female patients vaginal vestibule and vulva were cleaned with sterile moistened swabs. The patient was placed in kneeling position with the knees apart. Then she was asked to void urine and mid-stream specimen was taken straight into the sterile container. In boys the foreskin was retracted, the area around the urinary meatus was cleaned with sterile moist gauze and mid-stream specimen collected. Antibacterial agents were not used for the cleaning of urethral opening. For infants and young children who could not void on command, the urine was collected in adhesive sterile bags. The urine samples were either immediately processed in the laboratory or refrigerated at 4°C to be processed within 24 hours of the collection.

Culture

One loopful (5 ul) of well mixed uncentrifuged urine was spread on blood agar and Mac Conkey agar. After inoculation, the petri dish was incubated at 37°C for overnight. Number of colonies were counted and calculated per ml of urine. Physical examination and white and red cell count per mm³ of urine were performed by routine well-slide technique using uncentrifuged well mixed urine.

Identification of Organisms:

The nature of organisms in positive plates was identified by standard biochemical tests.

Sensitivity Testing:

Sensitivity was done by stoke method using wellco test agar. A sensitive strain of *Escherichia coli* (NCTC 10415) was used as control organism on each plate of sensitivity agar. Inoculum was standardised, special care being taken that inoculum was not too heavy as it has been shown that heavy inoculum invalidates tests to suiphonamide. Sensitivity was tested by using specified high concentration disc of co-trimoxazole, ampicillin, nitrofurantoin, tetracycline, kanamycin, carbenicillin, gentamicin and cephalixin. The discs were obtained commercially.

Results

A total of 231 children were included in the study. There were 125 males and 106 females. Their age distribution is shown in the accompanying figure.

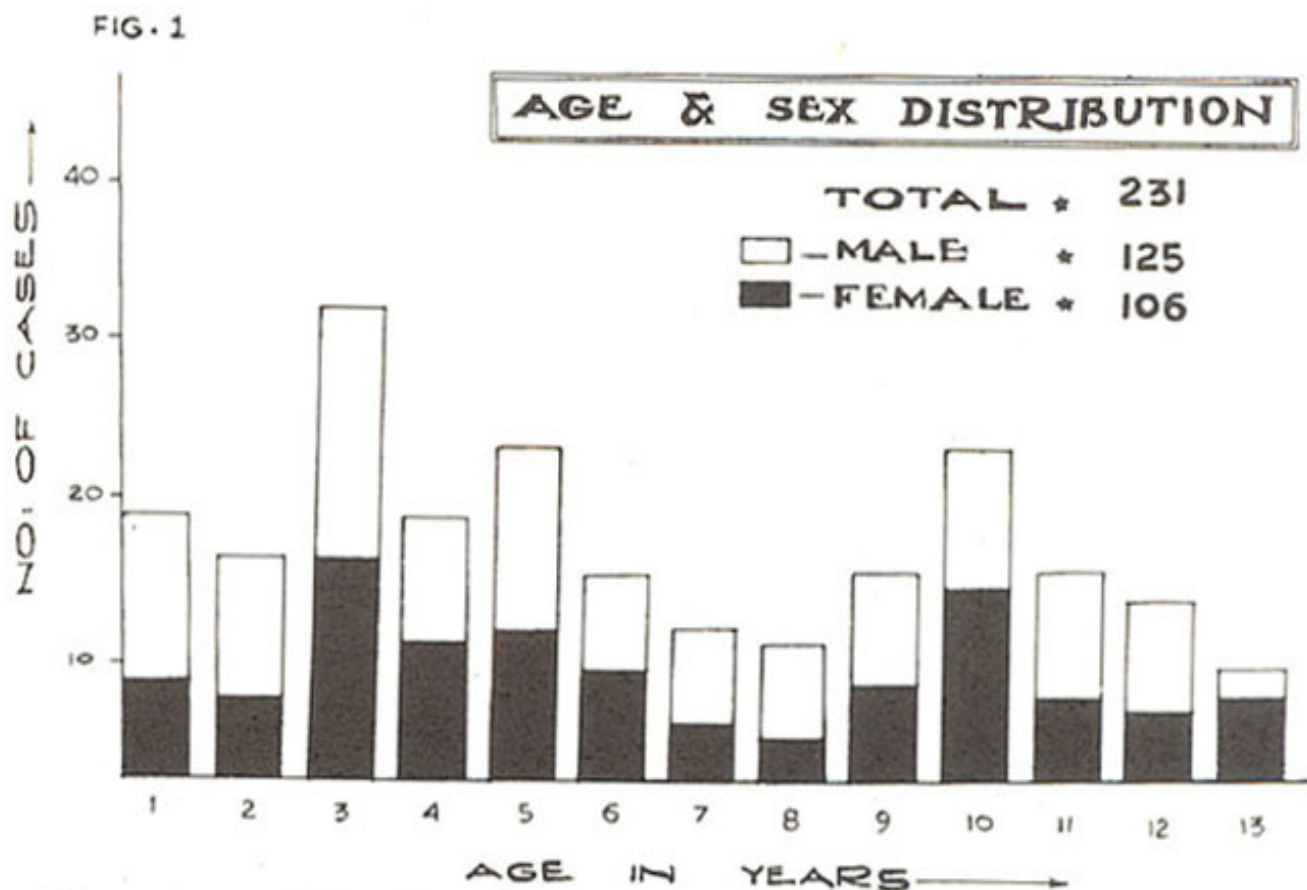


Fig. Age and Sex distribution.

The ages were rounded off to the next whole number, for example the infants of 0-1 year were classed under age I, and so on. There were more boys than girls: this corresponds with the general pattern of admissions in the paediatric ward. There were more children in the younger age groups especially upto 5 years. This also confirms with the usual distribution of cases in the children ward. In this series, there were 112 children upto age, which is nearly 50% of the whole group.

The results were interpreted in the light of the following criteria

As laid down by Kass(1956) , Mc Geachic and Kennedy (1963) and Dodge et al. (1973), the bacteriuria was regarded significant and an unequivocal diagnosis of UTI was made when the urine, on culture of a pure growth was found to contain 10^5 or more organisms per ml. However, only one specimen of urine was cultured in this study as against 2 to 3 specimens suggested by these authors.

A pure growth indicating excretion of less than 10^4 organisms per ml of urine was disregarded, and the case was interpreted as negative.

If the urine specimen contained 10^4 - 10^5 organisms per ml, of the same pathogen, the test was interpreted as doubtful and the urine was cultured again. If there was no change in the growth on second culture, the results were interpreted in the light of clinical history. A mixed growth was disregarded when all type of colonies counted together, gave growth of 10^5 organisms per ml. However, when a single type of colony. in a mixed growth produced a growth of 10^5 /ml or more, then the culture was repeated. A mixed growth can also be significant and indicative of UTI if each organism in the urine is in connection of 10^5 or more per ml. Mixed infections are common in chronic cases especially those with underlying anatomical defects of urinary tract.

Results of the urine culture are summarized in Table-I. Out of 231 children there were 158 cases (68%)

whose symptoms were related to urinary tract or could be suspected of being due to UTI. This sample represents symptomatic group; which the rest (32%) had symptoms which suggested involvement of systems other than renal tract. These children, though strictly not asymptomatic were taken to represent asymptomatic group. In the symptomatic group there were 10 positive cases (6%) of UTI where a pure growth of a single organism was obtained in concentration of 10^5 per ml of urine. In the asymptomatic group there were only 2 positive cases giving a percentage of 2.7%. The total percentage of UTI cases combining both the symptomatic and asymptomatic groups was 5%.

Table – 1
Significant Bacteriuria.

	Total	With Positive Growth	% age
Symptomatic Cases	158	10 (7F + 3M)	6 %
Asymptomatic Cases	73	2 (both F)	2.7 %
All Cases	231	12	5 %

M = Male
F = Female

Positive cases with a table 1 a significant growth are described in table II.

Table-II**Cases With Positive Urine Culture.**

S.No.	Case No.	Age	Sex	Urinalysis		Presenting Symptoms or Diagnosis	Anti biotics given	Urine Culture Report Significant (10^5 /ml) + pure growth
				Pus Cells	Red Cells			
1	49	7	F	+	+	Fever Oliguria Sore throat	—	Klebsiella Aerogenese
2	72	12	F	—	—	Dysuria	—	E. Coli
3	78	1	F	+	—	Fever	—	E. Coll
4	89	7	M	—	—	Fever	—	Micrococci
5	90	3	F	+	—	Enuresis Frequency	—	Staph. albus
6	106	2	M	+	—	Oliguria	Ampicillin	E. Coli
7	108	3	F	—	—	Fever	Amoxil	E. Coli
8	110	3	M	+	—	Abdominal Pain Fever	Septran —	E. Coli
9	127	1	F	+	+	Abdominal pain, Cloudy urine Cloudy, Smelling Urine	—	E. Coli
10	130	6	F	—	—	Frequency, Fever	Delacin C.	Enterobacter aerogenese
11	173	2	F	+	—	Kwashiorkor	Penicillin	E. Coli
12	185	6	F	—	—	Rickets	—	E. Coli

There were 9 girls and 3 boys. Seven cases had pus cells in the urine and only 2 positive cases had microscopic haematuria. In 8 cases a pure growth of E.Coli was obtained and there was one case each of Klebsiella, Micrococci, Staph, albus and Entrobacter aerogenese. Their sensitivities to commonly used antibiotics is given in Table III.

Table III

Sensitivity Pattern.

			SENSITIVITY TO ANTIBIOTICS								
S.No.	Case	Organism Isolated	Ampicillin	Gentamycin	Tetracycline	Nitrofurantoin	Cotrimoxazole	Nalidixic acid	Carbenicillin	Kanamycin	Cephalexin (Cephaloridine)
1	49	Klebsiella aerogenes	R	—	R	S	S	S	R	R	—
2	72	E. Coli	R	S	mS	S	S	S	—	S	—
3	78	E. Coli	R	S	mS	S	S	S	—	S	—
4	89	Micrococci	S	S	S	mS	S	S	—	S	—
5	90	Staph. albus	R	—	R	S	S	S	—	—	—
6	106	E. Coli	R	S	R	S	R	S	—	R	S
7	108	E. Coli	mS	S	R	S	R	S	—	S	S
8	110	E. Coli	R	S	R	S	R	S	—	S	S
9	127	E. Coli	R	S	R	S	S	S	—	S	S
10	130	Enterobacter aerogenes	R	S	R	S	R	S	—	R	mS
11	173	E. Coli	S	S	R	S	S	S	S	—	S
12	185	E. Coli	S	S	R	S	S	S	—	S	S

S = Sensitive R = Resistant mS = mildly sensitive

Most of the organisms were sensitive to Gentamycin, Kanamycin, Nalidixic acid, Nitrofurantoin and cephalixin, while their sensitivity to cotrimoxazole was mixed. Most organisms were resistant to tetracycline and ampicillin.

There were 37 cases where a mixed growth of 10^5 /ml was obtained. These were interpreted as contaminated cases. Nearly half of these were in the younger age group (5 years or less) and the sex distribution was also nearly equal (17M, 20F).

Discussion

As an epidemiological survey in the frame work of a small paediatric unit, this study presents rather a small and biased sample. To establish significant bacteriuria in normal population of children the sample should have been taken from the community at large. However, in view of the extreme paucity of work in this field the data is presented to provide some useful pointers.

It also highlights the problems of diagnosis and management of UTI in children especially in our setting. This work could perhaps be regarded as a pilot study and should lead to further more extensive work. The choice of hospital patients as asymptomatic group who were apparently suffering from diseases of systems other than renal tract, is not desirable but per force this was done. Even so the results obtained in this group can be compared with those of other similar studies. The frequency of significant bacteriuria in this sample was found to be 2.7%. In a study of 1410 normal girls, aged 6-12 years, Kunin et al. (1960) found UTI in 1.0% cases. Looking at a normal population of 1647 boys he found no case of UTI. All our positive cases were also in girls. Savage et al. (1973) and Cohen (1972) found 1.6% of cases suffering from UTI were normal school girls, while another study on a similar population showed 2.2% of cases suffering from significant bacteriuria (Dodge et al., 1974).

In the symptomatic group 6% cases of UTI were detected. As expected there were more girls (seven out

of ten) among the positive cases, but their total percentage seems to be too low. Cohen (1972) in 368 girls of 2-24 years of age, suffering from UTI found that 77% of them were symptomatic and one third of these had febrile illness. One of the factors which could have affected a positive result in our series was the use of antibiotics by the patient at the time of culture. Fort⁷ seven cases out of a total 23 1 cases were having anti-biotics at the time of urine collection. In any case, comparison with Cohen's sample is not valid because in his series, there was analysis of known and diagnosed cases of UTI while we were studying the general sample of hospitalised children. An over all frequency of UTI in our series was 5% which is perhaps nearer the actual figure. In some of these cases anti-biotics can be blamed for negative and equivocal results, but other factors might be at work. Seven cases out of 12 diagnosed as UTI in our series showed pyuria, which confirms the previous studies and points out the limitation of routine urinalysis in the diagnosis of UTI. Pryles and Lustik compared urine bacterial counts with the presence of pyuria. They found that when the bacterial count was greater than 105/ml, 43 % had pyuria. White bacterial counts of 1,000 to 10,000/rnI, 6% had pyuria; and with sterile urine only 1% had pyuria.

Analysis of the sensitivities of the responsible organisms causing UTI, to commonly used antibiotics is interesting. The usual organisms causing UTI seems to be getting resistant to commonly used antibiotics including tetracycline, ampicillin and cotrimoxazole. Tetracyclines seem to fare the worst. However, cephalosporine, nalidixic acid, nitrofurantoin, gentamicin and kanamycin have shown far better performance. Because of the ease of administration, the treatment of UTI should better be chosen from the first three.

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