Original article

Etiology and resistance of asymptomatic bacteriuria isolates among school going children in Sanadaj-Iran

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Abstract

Objective: The objective of this study was to determine the etiology and antimicrobial susceptibility patterns of asymptomatic bacteriuria pathogens isolated among school going children in Sanandaj, Iran. **Methods**: A total of 1 457 urine samples of 5 to 10 years children from forty different schools of Sanandaj city were screened to see asymptomatic bacteriuria during November 2007 to June 2008. **Results**: Bacterial colony count of over (105) colony forming units CFU/ mL were found in 28 (1.90%) of total cases, with 767 (52.64%) girls and 690 (47.35%) boys. The highest class-specific prevalence was found in the fourth standard (2.8%) and the lowest in the first standard (1.0%). The dominant bacterial isolates were *E. coli* 20 (74.1%), followed by *Klebsiella pneumoniae* 04 (14.8%) and *Staphylococcus aureus* 04 (14.8%). Cefotaxime, Cefixime, Kanamycin, Co-trimoxazole, nalidicxic acid, nitrofurantoin and Amoxicillin, resistance rates were above 90.0%. Ceftriaxone expressed the highest susceptibility among *E. coli* isolates. Surprisingly, *S. aureus* showed 100.0% resistance to oxacillin. **Conclusion**: In the present study in which *Escherichia coli* is the most frequently incriminated as the causative agents. The results show a very serious antibiotic resistance of *E. coli* isolated. Surveillance and monitoring studies will be essential in preventing of renal scarring or other abnormalities.

Keywords: School going children; Asymptomatic Urinary tract infections

INTRODUCTION

Urinary tract infections (UTIs) represent the commonest genitourinary disease in children, and are the second commonest infection which affects them. Urinary tract infections in children are particularly important because their occurrence may be associated with some congenital abnormality of the urinary tract which may lead to recurrent infections causing damage to the urinary tract [1,2].

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Asymptomatic bacteriuria is defined as a significant bacterial count (usually 105 organism/mL) present in the urine of a person without symptoms. Asymptomatic bacteriuria is common, with varying prevalence by age, sex, sexual activity, and the presence of genitourinary abnormalities [3].

In children, detection of bacteriuria might lead to the detection of correctable abnormalities of the urinary tract and the prevention of renal scarring, obstructive atrophy, hypertension, and renal insufficiency. Asymptomatic bacteriuria develops into systematic urinary tract infections in fewer than 10% of cases [4].

About 10%-35% of infants and children with asymptomatic bacteriuria have vesicoureteral reflux and 6% – 37% have renal scarring or other abnor-

malities, whereas such abnormalities are uncommon in the general population of children [5].

After infancy, the prevalence of asymptomatic bacteriuria is much higher among girls (1% to 2%) than among boys (<0.1%) [6].

Some children with asymptomatic bacteriuria will have symptoms of urinary tract infection when questioned closely; many will have intermittent episodes of symptomatic bacteriuria. Screening for asymptomatic bacteriuria may lead to early detection of infection and identification of structural abnormalities coupled with appropriate management might lead to prevention of pyelonephritis and renal damage. It is not known how often these infections lead to kidney damage or whether their eradication can prevent kidney damage. Therefore, early diagnosis and prompt antimicrobial treatment are required to minimize renal scarring and progressive kidney damage. To prove whether it would be possible to prevent kidney damage by controlling infection, it would be necessary to screen the school children of a particular age group. This would be a tedious task unless a simple and economic screening procedure would be used which would be acceptable to the children, parents, and school health authorities.

These recurrent UTIs are thought to put children at higher risk for long-term renal damage, such as renal scarring, reduced renal function, and eventual hypertension in adulthood. Several studies reported that the proportion of cases vary in different areas. Canadian Task Force on Preventive Health Care [7] showed the prevalence of asymptomatic bacteriuria in school age children (4 to 11 years) was 1.8% in female and negligible in male. After infancy, the prevalence of asymptomatic bacteriuria is much higher among girls (1% to 2%) than among boys (<0.1%).

The present investigation was carried out to determine the occurrence of asymptomatic bacteriuria among school going children, to isolate the etiological agents for asymptomatic bacteriuria and to know their antimicrobial resistant pattern.

MATERIALS AND METHODS

This investigation was carried out in the Microbiology laboratory at Qodes hospital which is affiliated to the Kurdistan University of Medical Sciences, Sanandaj, Kurdistan. During the period between October 2007 and July 2008, a total of 1457 early morning mid-stream urine samples of 5 to 10 years old children from 40 different schools of Sanandaj city were collected and examined for asymptomatic bacteriuria. All the urine samples were transported to the laboratory within half an hour to one hour. It is worth to note that before each school was visited, care was taken to notify the Head Masters/Mistress and other staff about the investigation to be carried. As the collection of urine sample from the children was difficult, the instruction to the parents on the collection of mid-stream urine sample was typed on a paper and copies were distributed to the children along with sterile wide mouth bottles.

Each sample was observed for the presence of pus cells, RBCs, epithelial cells, casts and crystals then inoculated with a 0.01 mL platinum loop onto blood agar and MacConkey agar plates. The plates were incubated at 35°C up to 48 hours. Positive culture was defined if bacterial colony counts was more than 10^5 colony.

Bacterial isolates were identified by conventional biochemical tests [8]. Antibiotic susceptibilities were determined by disc diffusion method on Mueller Hinton agar according to Kirby Bauer's procedure[9].

RESULTS

Bacterial colony count of over 10^5 colony forming units CFU/ mL were found in 28 (1.90%) of total cases, with 767 (52.64%) girls and 690 (47.35%) boys. The highest class-specific prevalence was found in the fourth standard (2.80%) and the lowest in the first standard (1.00%) (Table 1). The dominant bacteria isolates were *E. coli* 20 (74.10%), followed by *Klebsiella pneumoniae* 04 (14.80%) (Talbe 2). Cefotaxime, Cefixime, Kanamycin, Co-trimoxazole, nalidicxic acid, nitrofurantoin and Amoxicillin, resistance rates were above 90.0%. Ceftriaxone expressed the highest susceptibility among *E. coli* isolates. Surprisingly, *S. aureus* showed 100.0% resistance to oxacillin. It is worth to note that *Klebsiella pneumoniae* showed 75.0% resistance to amoxicillin and ampicillin, Table 3.

DISCUSSION

The study found twenty eight significant bacteriuria among 1 457 school going children at Sanandaj, giving a prevalence rate of 1.90%. Rate of 1.39% have been reported from Nepal, 10.58 from India and 0.12% in Malaysian school children [10-12].

Another study from Canadian Task Force on preventive health care showed the incidence of asymptomatic bacteriuria from age 4 to 11 years was 0% for male and 1.8% for female school age children [13]. Therefore, the prevalence of asymptomatic bacteriuria in school going children varies among different studies. However, present study shows that the incidence rate of asymptomatic bacteriuria is 1.9% from age 5 to 10 years.

The dominant organisms were *E. coli* 20 (74.1%), followed by *Klebsiella pneumoniae* 04 (14.8%) and *Staphylococcus aureus* 04 (14.8%). This is almost similar to the findings in previous studies by Jalali et al in Iran [14]. This could be due to the fact that urinary stasis is common in children and since most *E. coli* strains prefer that environment, they cause AUTI.

Naylon GRE[15] found the organisms most frequently isolated in asymptomatic bacteriuria and urinary tract infection include species of Enterobacteriaceae especially *Escherichia coli* and other gram negative bacteria.

This study has found that cefuroxime were very effective against the urinary isolates. The prevalence of resistance of urinary isolates particularly, *E. coli* to Cefotaxime, Cefixime, Kanamycin, Co-trimoxazole, nalidicxic acid, nitrofurantoin and Amoxicillin, resistance rates were above 90%. Surprisingly, *S. aureus* showed 100% resistance to oxacillin.

Other antibiotics, like nitrofurantoin and gentamicin were 25% resistant to *E. coli* strains. In another study of urinary tract infection from outpatients in Canada, Zhanel, et al. found resistance to the same antimicrobials but at a much lower rate of resistance [16]. Although gentamicin is also effective in treating asymptomatic bacteriuria, it is known to be nephrotoxic [17]. Gentamicin should therefore be used when absolutely necessary.

In conclusion, amongst the bacterial agent, *Escherichia coli* is the most frequently incriminated as the causative agents of asymptomatic bacteriuria. These results advise against the AUTI use of Ceftriaxone and ciprofloxacin as an antibiotic therapy. In addition, surveillance and monitoring studies will be essential in preventing of renal scarring or other abnormalities.

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Table 1 Distribution of primary school children age and sex

Class	Girls	Boys	No. of samples	No. of isolates	Isolates (%)
First standard	150	143	293	03	1.00
Second standard	163	130	293	05	1.70
Third standard	173	117	290	05	1.70
Fourth standard	149	141	290	08	2.80
Fifth standard	132	159	291	07	0.24
Total	767	690	1 457	28	1.90

Table 2 Organisms isolated from urine samples

Bacterial isolates	No. of isolates	No. of isolates in %
Escherichia coli	20	74.1
Klebsiella pneumoniae	04	14.8
Staphylococcus aureus	04	14.8

Table 3 Antibiotic resistance pattern of all the isolates

antibiotics	*E. coli*	*K. pneumoniae*	*S. aureus*
NA	75.0	50.0	ND
CP	0.0	0.0	0.0
CRO	0.0	0.0	0.0
FM	95.0	50.0	0.0
CN	50.0	0.0	0.0
GM	50.0	75.0	0.0
AM	75.0	75.0	50.0
AXM	90.0	75.0	50.0
SXT	85.0	50.0	50.0
K	95.0	0.0	0.0
Oxacillin	ND	ND	100.0
CTX	100.0	0.0	0.0
CFM	95.0	0.0	0.0

NA: nalidicxic acid, CP: Ciprofloxacin, CRO: Ceftriaxon, FM: nitrofurantoin, CN: Cephalexin, GM: Gentamicin, AM: Ampicillin, AXM: Amoxycillin, SXT: Co-trimoxazole, K: Kanamycin, CTX : cefotaxime, CFM: Cefixime

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