

Prevalence of asymptomatic bacteriuria in school going children in Pokhara valley

Jha BK¹, Singh YI²

¹Lecturer, ²Professor and Head, Department of Microbiology, Manipal College of Medical Sciences, Pokhara

Abstract

Objectives: There were mainly two objectives of the study. One was to detect bacteriuria in school going children in Pokhara valley and the other was to identify the causative organisms in various age groups in children.

Materials and methods: This study was carried out in the Microbiology laboratory of The School of Pharmaceutical and Biomedical Sciences, Simalchaur, Pokhara University, Nepal. A total of 502 urine samples of 5 to 13 years children from different schools of Pokhara valley were screened to see asymptomatic bacteriuria during January 2005 to June 2005. A sterile wide mouth container was given to each student to collect mid-stream urine samples. All the urine samples were transported to the Microbiology laboratory within half an hour to one hour. The samples were processed for microscopical examination to observe for turbidity and the presence of protein and sugar by dipstick method, microscopical examination to see pus cells, RBCs, epithelial cells, casts and crystals, culture of urine samples on Blood agar and MacConkey agar to identify the potential pathogens. The antibiotic sensitivity test was performed for those bacteria which were grown on culture. The colony count was evaluated and organisms were identified by biochemical tests.

Result: Out of 502 samples, 7(1.39%) samples grew the bacterial pathogens that are responsible to cause urinary tract infection. Among them *Escherichia coli* 4(57.14%) was the predominant bacterial pathogen.

Conclusion: Study of asymptomatic bacteriuria is important as found in the present study in which *Escherichia coli* was the most frequently incriminated as the causative agents.

Key words: Asymptomatic bacteriuria, *Escherichia coli*, children

Asymptomatic bacteriuria is defined as a significant bacterial count (usually 10^5 organism /ml) present in the urine of a person without symptoms.¹ A study performed from Canadian Task Force on Preventive Health Care showed the prevalence of asymptomatic bacteriuria in school age children (4 to 11 years) was 1.8% in female and negligible in male.¹ 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.² About 10-35% of infants and children with asymptomatic bacteriuria have vesicoureteral reflux and 6-37% have renal scarring or other abnormalities, whereas such abnormalities are uncommon in the general population of children.^{3,4} During infancy, the prevalence of asymptomatic bacteriuria is higher among boys (2.5%) than girls (0.9%), in part because boys have structural abnormalities of the urinary tract more frequently than girls.⁵ After infancy, the prevalence of asymptomatic bacteriuria is much higher among girls (1% to 2%) than among boys (<0.1%).⁵ Asymptomatic bacteriuria develops into systematic urinary tract infections in fewer than 10% of cases.⁵ In children, asymptomatic bacteriuria may be a sign of underlying urinary tract abnormalities.³ Approximately 5-6% of girls have at least one

episode of bacteriuria between first grade and their graduation from high school and as many as 80% of cases children experience recurrent infections.³ Data on the proportion of cases vary in different areas. One study found the incidence of asymptomatic bacteriuria in infants younger than 23 months was 0.5% in boys, 1.8% in girls.⁶ In children of 5 to 10 years of age, it was estimated to be about 1% to 1.5%.⁷ The study from the journal of postgraduate medicine shows the prevalence of bacteriuria in children 1 to 7 years of age, the incidence was 7.8% in girls and 1.6% in boys.⁸

Materials and methods

This study was carried out in the Department of Microbiology of The School of Pharmaceutical and Biomedical Sciences, Simalchaur, Pokhara University, Nepal. A total of 502 early morning mid-stream urine samples of 5 to 13 years old children from different schools of Pokhara valley were collected from January 2005 to June 2005.

Correspondence

Bijay Kumar Jha
Lecturer
Department of Microbiology
Manipal College of Medical Sciences, Pokhara
E-mail: bijaykja@hotmail.com

Among all the students 269 were boys and 233 were girls. A sterile wide mouth container was given to each student to collect mid-stream urine samples. All the urine samples were transported to the laboratory within half an hour to one hour. The distance from laboratory to school is about 5 to 10 minutes. Hence not much time was lost for transportation of samples. Urine samples were processed for macroscopic examination, microscopic examination, culture and identification by biochemical tests.

Macroscopic examination:

All the urine samples were observed for turbidity and the presence of protein and sugar by dipstick method.

Microscopic examination:

All urine samples were centrifuged at 3000 rpm for 5 minutes and observed for the presence of pus cells, RBCs, epithelial cells, casts and crystals. Microscopical examination of urine was done principally to detect the presence of increased numbers of polymorphs (pyuria) as an indication of infection in the urinary tract.⁹

Culture:

A standard loop technique⁹ was used to place 0.01 ml of urine on Blood agar and MacConkey agar media. The plates were incubated at 37^oC for 16 to 18 hours. The number of colonies was counted to quantify the organism.

Biochemical tests:

Organisms were identified by putting the general biochemical tests like Catalase test, Oxidase test, Triple sugar iron agar (TSI), Simmon’s Citrate medium, Christensen’s Urea agar, Sulphide Indole Motility medium, Bile esculin agar and sugar fermentation tests.

Antibiotic susceptibility testing:

Antibiotic susceptibility testing was done according to Kirby Bauer’s method⁹ for all of the isolates. The antibiotic discs (each of 6 mm diameter) used were ampicillin (10 mcg), amikacin (10 mcg), nalidixic acid (30 mcg), nitrofurantoin (100 mcg), norfloxacin (10 mcg), ciprofloxacin (5 mcg), gentamycin (10 mcg), ceftazidime (30 mcg), cefotaxime(30 mcg).

All positive samples were rechecked by collecting the second urine samples from them to rule out the possible contamination.

Result

A total of 502 urine samples were collected from the students of two different schools of Pokhara, Nepal. Out of 502 samples that were processed, 7 (1.39%) samples grew the bacterial pathogens that are responsible to cause urinary tract infection (Table 1).

Urine samples were collected from different age groups of school going children (Table 2). Among the samples which were collected from the children, females were predominant in number. Table 2 shows children age and sex distribution as well as number of isolates from all the samples of school children of different age groups.

The striking feature was the gradual increase in the incidence of asymptomatic bacteriuria in higher ages which is shown in Table 2.

Bacterial pathogens were isolated from 5 female children students and only from 2 male children students. The female to male ratio was 2.5:1.

Antibiotic susceptibility test was performed for all the isolates. All isolates were sensitive to three or more than three antibiotics. Table 3 reveals antibiotic susceptibility pattern of various isolates.

Table 1: Organisms isolated from urine samples

Bacterial isolates	No. of isolates	No. of isolates in %
Escherichia coli	4	57.16
Klebsiella pneumoniae	1	14.28
Enterococcus fecalis	1	14.28
Pseudomonas aeruginosa	1	14.28
Total	7	100

Table2: Distribution of children age and sexes among the various age groups.

Age (Years)	Male	Female	No. of samples	No. of isolates	Isolates in %
5-7	35	38	73	0	0
8-9	125	104	229	1	14.30
10-11	32	39	71	3	42.85
12-13	58	71	129	3	42.85
Total	250	252	502	7	100

Table 3: Antibiotic susceptibility pattern of all the isolates

Escherichia coli- Isolate no.1	Escherichia coli- Isolate no.2
Ampicillin-----Resistance Norfloxacin-----Sensitive Nitrofurantoin-----Resistance Ciprofloxacin-----Sensitive Gentamycin-----Sensitive Nalidixic acid-----Sensitive	Ampicillin----- Sensitive Norfloxacin----- -Sensitive Nitrofurantoin-----Sensitive Ciprofloxacin-----Sensitive Gentamycin-----Sensitive Nalidixic acid-----Sensitive
Escherichia coli- Isolate no.3	Escherichia coli- Isolate no.4
Ampicillin-----Resistance Norfloxacin-----Sensitive Nitrofurantoin-----Sensitive Ciprofloxacin-----Sensitive Gentamycin-----Resistance Nalidixic acid-----Sensitive	Ampicillin-----Sensitive Norfloxacin-----Sensitive Nitrofurantoin-----Sensitive Ciprofloxacin-----Sensitive Gentamycin-----Resistance Nalidixic acid-----Sensitive
Enterococcus faecalis	Klebsiella pneumoniae
Ampicillin----- Sensitive Norfloxacin----- Sensitive Nitrofurantoin-----Sensitive Ciprofloxacin-----Sensitive Gentamycin-----Resistance Nalidixic acid-----Resistance	Ampicillin-----Resistance Norfloxacin----- Sensitive Nitrofurantoin-----Sensitive Ciprofloxacin-----Sensitive Gentamycin-----Resistance Nalidixic acid-----Sensitive
Pseudomonas aeruginosa	
Ampicillin----- --Resistance Gentamycin----- --Resistance Amikacin-----Sensitive Ciprofloxacin-----Sensitive Ceftazidime-----Sensitive Cefotaxime-----Sensitive	

Discussion

In children, it may be a sign of underlying urinary tract abnormalities. The present study was therefore undertaken to ascertain the rate of isolation of bacterial pathogens from urine samples of asymptomatic school going children.

The incidence of asymptomatic bacteriuria in school going children varies among different studies. One study conducted by McLachlin MSF 1973, showed the incidence of isolates in children of 5 to 10 years of age, the prevalence is above 1% to 1.5%⁷. However, present study shows that the incidence rate of asymptomatic bacteriuria is 1.39% from age 5 to 13 years.

Naylon GRE found the organisms most frequently isolated in asymptomatic bacteriuria and urinary tract infection include species of Enterobacteriaceae especially *Escherichia coli* and other gram negative bacteria¹⁰. The findings of the

present study are also more or less similar with the study conducted by Naylon GRE 1973.

Kumar CSV et al found the gradual increase in the incidence of asymptomatic bacteriuria in girls from 11 years (7.5%) to 15 years (13.66%)¹¹. This study shows the incidence of asymptomatic bacteriuria from 11 years to 15 years is the same but there is gradual increase in incidence from 8 years to 11 years.

One 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 and also showed the incidence of male was 0.026% and female was 1.1 to 2.4% between the ages 5 years and 20 years¹. In present study the female to male ratio is 2.5:1. It also shows the prevalence of asymptomatic bacteriuria in female between age group 5 and 13 years is 1% and male is 0.39%. Urinary tract infection can pose a major risk to a child's well being¹². Symptomatic and

asymptomatic bacteriuria during infancy is generally characterized by a benign outcome. However, in some children episodes of renal damage have been reported.¹²

We recommend that bacteriuria of 10^5 organisms for mid-stream urine, observed on successive cultures in children and asymptomatic pregnant women, should be considered significant bacteriuria and should be treated with antibiotic chosen on the basis of the in vitro antibiotic sensitivity of the organism.¹³ However, it should be pointed out that other investigators have observed that treatment of asymptomatic bacteriuria in childhood does not prevent recurrences of infection.²

Conclusion

Amongst the bacterial agent, *Escherichia coli* is the most frequently incriminated as the causative agents of asymptomatic bacteriuria. Some observational studies suggest that persons with untreated asymptomatic bacteriuria are at increased risk of developing symptomatic urinary tract infections and other complications. Evidence is not conclusive, however, that these clinical outcomes are caused by bacteriuria (especially in the absence of a structural abnormality), or that early treatment results in important clinical benefits. This study suggests that periodical school health survey is essential for good health of school going children.

References

1. Smith MBH. Screening for urinary infection in asymptomatic infants and children. In: Canadian Task Force on the Periodic Health Examination. Canadian Guide to Clinical Preventive Health Care. Ottawa: Health Canada, 1994; 220-30.
2. Savage DCL, Howie G, Adler K. Controlled trial of therapy in covert bacteriuria in childhood. *Lancet* 1975; 1:358-361.
3. Kunin CM. Detection, prevention and management of urinary tract infections, 4th edition. Philadelphia: Lea and Febiger, 1987.
4. Jones BW, Headstream JW. Vesicoreflux in children. *Journal of Urology*. 1958; 80:1067-1069.
5. American Academy of Pediatrics. Recommendation for pediatric preventive health care. *Pediatrics* 1995; 96:373-374.
6. Siegel SR, Siegel B, Sokoloff BZ, Kenter MH. Urinary infection in infants and preschool children. *AJDC* 1980;134:369-372.
7. McLachlin MSF, Meller ST, Vemin Jones ER. Urinary tract infection in school girls with covert bacteriuria. *Arch Dis Child* 1973; 50:253.
8. Jodal U. The natural history of bacteriuria in childhood. *Infect Dis Clin North Am* 1987; 1(4): 713-29.
9. Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie and McCartney Practical Medical Microbiology. 14th edition. Churchill Livingstone, 1996:86-88.
10. Naylon GRE. A 16 month analysis of urinary tract infection in children. *Journal of Medical Microbiology* 1984; 17:31.
11. Kumar CVS, Jairam A, Chetan S, Sudesh P, Kapur I, Srikaramallya. Asymptomatic bacteriuria in school going children. *Indian Journal of Medical Microbiology* 2002;20:29-32.
12. Davision JM, Sportt MS, Selkon JB. The effect of covert bacteriuria in school girls on renal function at 18 years and during pregnancy. *Lancet* 1984; 2:651.
13. Kass EH: Infection of urinary tract and current therapy in infection of scores 1983-84, Philadelphia 1983:161-162.