

Asymptomatic bacteriuria in preadolescent girls

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ABSTRACT

Background. The detection of asymptomatic bacteriuria in preadolescent girls may be important due to its effects on subsequent pregnancies. **Objective.** To describe the prevalence of asymptomatic bacteriuria in preadolescent girls and the value of the nitrite test for screening. **Material and methods.** Cross-sectional study in girls aged 9 to 13 years. Bacteriuria was defined as the growth of > 100,000 CFU/mL in 2 consecutive urine specimens. **Results.** Three hundred and twenty seven girls were included. Asymptomatic bacteriuria was found in 7 girls, so the prevalence was 2.1% (95% CI, 1 to 4.4%). *Escherichia coli* was the isolated agent in all the cases. Focused interrogatory found history of urinary symptoms in 6 girls. The utility values of the nitrite test were: sensitivity, 1; specificity, 0.9; positive likelihood ratio, 10; and negative predictive value, 1. **Conclusions.** The prevalence of asymptomatic bacteriuria in preadolescent girls in this Mexican study is similar to the one reported internationally; it is reasonable to consider its early detection to avoid its effects on future pregnancies. Nitrite test seems to be good for screening.

Key words. Bacteriuria. Asymptomatic infection. Urinary tract infection. Urinalysis. Urinalysis-economy.

INTRODUCTION

Asymptomatic bacteriuria is the presence of a specified quantitative count of bacteria in urine from a person without clinical signs or symptoms of infection. Quantitative definition of bacteriuria is the growth of > 100,000 CFU/mL in 2 consecutive urine specimens.^{1,2} The organisms that can infect or colonize the urinary tract are usually gram-negative bacilli, being *Escherichia coli* responsible for > 90%

Bacteriuria asintomática en niñas preadolescentes

RESUMEN

Antecedentes. La detección de bacteriuria asintomática en niñas preadolescentes puede tener importancia por sus efectos en embarazos posteriores. **Objetivo.** Describir la prevalencia de bacteriuria asintomática en niñas preadolescentes y el valor de la prueba de nitritos para el escrutinio. **Material y métodos.** Estudio transversal en niñas de nueve a 13 años. Se definió bacteriuria como el desarrollo > 100,000 UFC/mL en dos muestras de orina consecutivas. **Resultados.** Se incluyeron 327 niñas. Se identificó bacteriuria asintomática en siete, para una prevalencia de 2.1% (IC 95%, una a 4.4%). *Escherichia coli* fue el microorganismo aislado en todos los casos. En el interrogatorio dirigido, seis niñas refirieron antecedentes de síntomas urinarios. Los valores de utilidad de la prueba de nitritos fueron: sensibilidad, 1; especificidad, 0.9; índice de verosimilitud positivo, 10, y valor predictivo negativo, 1. **Conclusiones.** La prevalencia de bacteriuria asintomática en el presente estudio de niñas mexicanas es semejante a la internacional y es razonable considerar su detección oportuna para prevenir sus efectos en un futuro embarazo. La reacción de nitritos parece ser una buena prueba de escrutinio.

Palabras clave. Bacteriuria. Infección asintomática. Infección del tracto urinario. Urianálisis. Urianálisis-economía.

of symptomatic and asymptomatic urinary tract infections.^{3,4}

The prevalence of asymptomatic bacteriuria varies according to the age groups, as well as the presence of comorbidities. At school age, the prevalence is 1-2% and in sexually active young women is about 5%, rising to 8.6% in postmenopausal women and up to 20% in the presence of diabetes.^{5,6}

In asymptomatic bacteriuria, the organisms remain in the urinary tract without being eliminated

by the host as they generate insufficient response to eventually produce symptoms of infection, although they can induce a local response, causing pyuria (> 10 WBC/field) in 43% of schoolgirls and in 32% of healthy young women with asymptomatic bacteriuria, which may persist for years.⁷

Increased risk of symptomatic infection and pyelonephritis in bacteriuric women has been described in short and long-term prospective studies, but these events are not preventable by the treatment of bacteriuria, so the screening for bacteriuria in premenopausal, nonpregnant women is not indicated.^{2,8,9} However, to know the prevalence of bacteriuria in preadolescent girls and the availability of a simple and feasible screening test is important because the treatment of bacteriuria in future pregnancies can reduce the risk of lowbirth weight infants and preterm delivery.^{2,10,11}

In the present study we aimed to describe the prevalence of asymptomatic bacteriuria in schoolgirls aged 9 to 13 years and to determine the value of the nitrite test for screening. As a secondary objective we planned to provide treatment to girls with asymptomatic bacteriuria to assess their evolution after discontinuing treatment.

MATERIAL AND METHODS

A cross-sectional study was performed, which included a consecutive and non-random sample of girls of the fourth through sixth grade of elementary education from public and private schools in León, México. We excluded girls with a history of medical attention for urinary tract infection.

Definitions

Significant bacteriuria was considered as the bacterial growth of at least 100,000 CFU/mL in two consecutive urine specimens, taken at least 7 days apart.²

Microbiological procedures

Each girl received a sterile container and two plastic bags, one with a swab impregnated with non-antiseptic soap and one with three swabs with clean water. They were instructed to do the initial cleaning with soap and then with the rest of the swabs in the periurethral area to proceed to catch the midstream urine. Within two hours, the containers were transported in ice boxes to the laboratory, where plating

was performed using a calibrated loop of 1 microliter on blood agar and MacConkey agars, which were incubated for 20 to 24 h in aerobic conditions at 35 °C. If significant bacteriuria was detected, a second specimen was cultured, which was taken at least 7 days apart from the first one. Bacterial identification was performed by conventional biochemical tests and antimicrobial sensitivity was performed by the method of diffusion in agar plate in accordance with the Clinical and Laboratory Standards Institute.¹² The nitrite test was detected with an automatic strip reader (Multistix 10 SG, Siemens Medical Solutions Ecatepec, México).

In girls with asymptomatic bacteriuria we performed determinations of full blood count, glucose, and serum creatinine and prescribed antibiotic according to the results of the culture. After the treatment was started, additional urine cultures were performed at week 1 and 4.

Statistical analysis and ethical issues

The sample size was calculated to be at least 280 to have a 95% confidence of detecting a proportion of asymptomatic bacteriuria of 1 to 5%. Asymptomatic bacteriuria results were expressed in proportions with 95% confidence interval (95% CI). The results of weight and height were used to calculate the body mass index (BMI), which was compared against tables of percentiles of the Centers for Disease Control and Prevention according to the age, and overweight was considered as a BMI above the 85 percentile.¹⁸ All information obtained in the study was confidential and informed consent was obtained from the parents. Cultures and other determinations had no cost to the participants.

RESULTS

Overall, 327 girls aged between 9 and 13 years were included. Four girls whose parents reported a history of consultation for urinary problems were not included. The mean age was 10.2 years, with a median of 10 and a standard deviation (SD) of 1.02.

From the initial 327 specimens, 18 (5.5%, 95% CI 3.5 to 8.5%) had significant bacteriuria, but only 7 were confirmed in the second specimen, so the prevalence of asymptomatic bacteriuria was 2.1% (95% CI 1 to 4.4%). The remaining 11 were considered to be transient bacteriuria or contamination (3.4%, 95% CI 1.9 to 6%) and were excluded for the analysis of the utility values of the nitrite test. The utility values of

Table 1. Description of 7 girls with asymptomatic bacteriuria.

Variable	1	2	3	4	5	6	7
Age (yr)	11	11	9	9	10	10	10
BMI*(percentile)	98	87	60	92	40	96	90
Enuresis after 4 years	+	-	-	+	+	+	-
Fetid urine	-	+	+	-	+	+	-
Urinary urgency	-	-	-	-	-	+	-
Follow-up culture to 1/4 week	-/+	-/+	-/LF	-/+	-/-	+/LF	+/+

+: positive, -: negative. LF: lost to follow-up. Source: <http://www.cdc.gov/growthcharts/>

the nitrites test were: sensitivity, 1; specificity, 0.9; positive predictive value, 0.18; negative predictive value, 1; and positive likelihood ratio (LR +), 10.

The 7 cases of asymptomatic bacteriuria were caused by *E. coli*, from which 5 were resistant to ampicillin, 4 to trimethoprim/sulfamethoxazole, 4 to amoxicillin/clavulanic acid, and 1 to ciprofloxacin, gentamicin and ceftriaxone (producing extended-spectrum beta-lactamase). None was resistant to fosfomycin or nitrofurantoin.

Anthropometric data were taken from 218 girls. Among the 211 girls without asymptomatic bacteriuria 77 (37%) were overweighted in comparison with 5 (71%) of the girls with asymptomatic bacteriuria, although the difference was not statistically significant.

Description of girls with bacteriuria

None of the 7 girls with asymptomatic bacteriuria showed signs of disease. All the results of the blood counts, glucose, and serum creatinine were normal. Table 1 details the characteristics of the 7 girls with bacteriuria; 5 were overweighted, and 6 had, by the directed interrogation, a history of urinary symptoms such as enuresis, urgency, or fetid urine, but none of them had symptoms at the time of the study. For all, a treatment of nitrofurantoin for 14 days was prescribed at doses of 50 mg po, qid, which was not successful for bacteriuria eradication at 4 weeks in most cases.

DISCUSSION

Asymptomatic bacteriuria in healthy people is considered a minor problem that requires no treatment or clinical follow up, but it is considered relevant in pregnant women, and in people with renal transplant, severe neutropenia, or those submitted to urologic procedures.⁷

In the present study we were able to identify the prevalence of asymptomatic bacteriuria in preadolescent girls, which is similar to the prevalence previously reported by other authors.^{7,13,14} Additionally, since Enterobacteriaceae causes most cases of bacteriuria, we hypothesized that the nitrite strip test can be useful as a screening method, which proved to be true in our study. This is a major finding in our study, because with the observed utility values we can encourage the use of nitrite test in the common practice, minimizing the need for urine culture that could be less available. Even more, in our study we excluded 4 girls with a history of consultation for urinary tract infection, so the interrogation and the nitrite test may have a high diagnostic yield.

The knowledge of the prevalence of asymptomatic bacteriuria among preadolescents women and the validation of a feasible and reachable screening test such as the urine nitrite detection could have an impact in public health because in the near future these girls could become pregnant and they would be benefited receiving antimicrobial treatment that has been proven to reduce the risk of pyelonephritis and the frequency of lowbirth weight infants and preterm delivery.¹⁵⁻¹⁷

During the directed interrogatory we found that 6 of the 7 girls with bacteriuria had a history of enuresis, urinary urgency, or fetid urine which is concordant with the findings of previous studies; e.g. the Newcastle Asymptomatic Bacteriuria Research Group reported that a focused interrogation led to 70% of girls with asymptomatic bacteriuria reporting symptoms such as urgency or enuresis.¹⁴ If, as suggested by these data, most of the girls with asymptomatic bacteriuria have had clinical manifestations that allow detection, it would be a good practice to make a focused interrogation about urinary symptoms in every preadolescent girl.

To find a relationship between obesity and asymptomatic bacteriuria was not the main objective in our study, but it is important to observe that 5 of 7 of the girls with asymptomatic bacteriuria were overweighted (against just 37% of the girls without it). This is a topic for future research as our study seems to lack the power to find an association of clinical relevance.

We decided to provide antimicrobial therapy to the girls with asymptomatic bacteriuria to evaluate the evolution. As previously described, the treatment was unsuccessful to solve the bacteriuria in most cases. To the best of our knowledge, there is no consensus about the duration of antimicrobial treatment of asymptomatic bacteriuria in preadolescent girls.²

Our study has the limitation that the sample that was not taken randomly, but we consider that the consecutive sample obtained is equivalent because of its size and no selection biases. Furthermore, this study adds knowledge to the existing literature as it has two strengths: first, its sample size allows determining the prevalence with a narrow confidence; and second, it demonstrates the potential utility that the nitrite test may have for screening school-girl populations.

With the results of this study we have three conclusions. First, the rate of persistent bacteriuria in preadolescent girls in this Mexican study is similar to the one reported in the literature. Second, the nitrite test is a good screening test for detection of persistent bacteriuria in girls. Finally, since persistent bacteriuria could be harmful in pregnancy, it is reasonable to scrutinize preadolescent girls, which is done easily with the interrogation and the nitrite test.

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