

Asymptomatic Bacteriuria Among the Institutionalized Elderly

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Background: Urinary tract infections (UTI) are the most common type of infection among residents of long-term care facilities (LTCFs). The presence of asymptomatic bacteriuria among LTCF residents brings challenges to onsite health professionals. The aim of this study was to explore the prevalence and related factors of asymptomatic bacteriuria among the institutionalized elderly in Taiwan.

Methods: In 2002, residents of 2 private LTCFs participated in this study. History taking, anthropometric measurements, and urine and blood samplings were performed by experienced research staff. Urine bacterial culture was performed by a standard procedure; subjects with symptoms indicating UTI were excluded. Repeated urine bacterial culture was performed 1 week after screening tests. Bacteriuria was defined as 1 or more organisms isolated from 2 consecutive urine specimens ($\geq 10^5$ CFU [colony-forming units]/mL). Asymptomatic bacteriuria was defined as identical microorganisms isolated from 2 urine culture specimens taken at 1-week intervals from a subject who was free of UTI symptoms. The presence of asymptomatic bacteriuria and its related factors, such as age, sex, nutritional status, and long-term placement of urinary catheter, were evaluated.

Results: A total of 64 institutionalized Chinese elderly (mean age, 76.2 ± 9.1 years; male:female, 48:16) were collected. The prevalence of asymptomatic bacteriuria was 57.8% (37/64), and was not associated with age, sex, functional status, long-term foley catheter, or previous UTI history. The most commonly isolated organisms were *Escherichia coli* (29.7%), *Klebsiella pneumoniae* (21.6%), *Providentia stuartii* (16.2%), and *Pseudomonas aeruginosa* (13.5%). Moreover, 21.6% of them showed multiple organisms. Nutritional status (body mass index, serum levels of albumin, total cholesterol, total lymphocyte count, and hemoglobin) was similar between subjects with or without bacteriuria ($p > 0.05$).

Conclusion: Asymptomatic bacteriuria is common among Chinese residents in LTCFs. *Escherichia coli* was the most commonly cultured bacterium. Presence of asymptomatic bacteriuria was not associated with age, sex, functional status, catheter indwelling, previous history of UTI, or nutritional status of residents in LTCFs. [*J Chin Med Assoc* 2006;69(5):213–217]

Key Words: asymptomatic bacteriuria, institutionalized elderly, nutritional status, urinary catheterization, urinary tract infection

Introduction

Infection is an important issue in institutional care. The common infection sites of residents in long-term care facilities (LTCFs) include respiratory tract, urinary tract, skin and soft tissue. Urinary tract infections

(UTIs) are the most common;^{1,2} however, standard UTI symptoms are often vague in the elderly, thus adding to the difficulties and challenges in diagnosis and treatment. Advanced age in the institutionalized elderly frequently is accompanied by impaired functional status, cognitive deficits, expression

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difficulties, and poorer response to physical stress. The lack of sufficient laboratory support in LTCFs causes more difficulty in making an accurate and rapid diagnosis of UTI in the institutionalized elderly. Dipstick analysis is commonly used in the diagnosis of UTI; however, the presence of pyuria is not necessarily associated with clinical symptoms, especially among catheterized individuals. On the contrary, a documented bacteriuria with toxic microorganisms could be asymptomatic *per se*.

Asymptomatic bacteriuria is common both in the community-dwelling and institutionalized elderly.³ A number of factors may precipitate asymptomatic bacteriuria, including age-related changes in urologic function, multiple comorbid chronic illnesses, intervention procedures to the urinary tract because of incontinence, or neurogenic bladder caused by various pathologies.⁴ The association of asymptomatic bacteriuria with clinical outcome is weak, so antimicrobial treatment under such circumstances may be problematic.^{5,6} Its benefits should be justified by improving chronic urologic symptoms and reducing the prevalence of asymptomatic bacteriuria without risk of developing antimicrobial resistance, drug-related adverse effects, and medical costs.^{7,8} Although asymptomatic bacteriuria is not closely related to clinical care outcome, its linkage with functional status as a quality indicator of institutional care and infection control is noteworthy. In particular, as Taiwan increasingly becomes an aged society, institutional care should seriously be addressed to structure comprehensive care for the elderly. Therefore, we conducted this study to explore the prevalence and bacterial epidemiology of asymptomatic bacteriuria in Taiwan by studying residents of 2 private LTCFs, and to evaluate the relationship of asymptomatic bacteriuria with functional status and nutritional status.

Methods

In 2002, residents were enrolled in this study from 2 private LTCFs, who regularly were cared for by the home care team of Taipei Veterans General Hospital. They or their families gave full consent. The whole study was approved by the Ethical Committee of Taipei Veterans General Hospital.

At enrollment, subjects had no symptoms suggestive of UTI (e.g. fever, dysuria, frequency, urgency, gross hematuria, or suprapubic pain). Well-trained physicians took histories and gave physical examinations of study subjects. Records of past medical history, functional

status (expressed by Barthel index, and Barthel index < 20 was defined as functionally dependent), long-term indwelling bladder catheter, and previous hospitalizations for UTI were obtained in detail. Two well-trained nurses performed all the anthropometric measurements and drew the 10-hour overnight fasting blood for further tests. These included: body mass index (BMI), serum albumin, total cholesterol, total lymphocyte count, and hemoglobin using standard methods.

Urine specimens were carefully collected by the standard clean-catch technique for those patients who could cooperate completely, and the standard sterile procedure was used to collect urine specimens for those who used external condom catheters or bladder catheters. Urine specimens were taken to the laboratory for further examination within 4 hours.⁶ Repeat urine cultures were performed 1 week later, using the quantitative loop method; organisms were counted and identified by using standard microbiologic methods.⁹ Bacteriuria was defined as 1 or more organism isolated from 2 consecutive urine specimens ($\geq 10^5$ CFU [colony-forming units]/mL).¹⁰ Subjects who had symptoms that might indicate a UTI were excluded from the study and were referred to the in-charge physicians for treatment. Asymptomatic bacteriuria was defined as identical microorganisms isolated from 2 urine culture specimens taken at 1-week intervals from a subject who was free of UTI symptoms.⁷ Pyuria was defined as a urinalysis that disclosed more than 5 white blood cells per high-powered field under light microscopic examinations.

Comparisons between groups were performed by using the Chi-square test, Fisher's exact test, and Student's *t* test when appropriate, depending on the nature of data analyzed (SPSS 11.0, Chicago, IL, USA). For all tests, results with *p* values less than 0.05 (2-tailed) were considered statistically significant.

Results

A total of 64 institutionalized elderly (48 males and 16 females; mean age, 76.2 ± 9.1 years) were enrolled in this study. The mean Barthel index of all study subjects was 8.3 (range, 0–40); 93.8% were functionally dependent, and 68.8% were totally bedridden. Among all study subjects, 12 (18.8%) had a long-term indwelling bladder catheter, and 9 UTI-related hospitalizations had been recorded in the previous 1 year. The overall prevalence of asymptomatic bacteriuria was 57.8% (37/64).

Females had a higher prevalence of asymptomatic bacteriuria than males, although the difference did not reach statistical significance (75% vs 52.1%, $p = 0.09$). Subjects with asymptomatic bacteriuria tended to be older than their normal counterparts (77.8 ± 8.3 vs 74.0 ± 9.7 years, $p = 0.09$). Percentage of functional dependence among subjects with asymptomatic bacteriuria was similar to those without (94.6% vs 92.6%, $p = 0.57$). Subjects with asymptomatic bacteriuria were more prone to have a long-term indwelling bladder catheter, but the difference was not statistically significant (21.6% vs 14.8%, $p = 0.49$). In addition, the presence of asymptomatic bacteriuria was not associated with previous UTI-related hospitalizations (13.5% vs 14.8%, $p = 0.88$) (Table 1).

The most common microorganism isolated was *Escherichia coli* (29.7%, 11/37), followed by *Klebsiella pneumoniae* (21.6%, 8/37), *Providentia stuartii* (16.2%, 6/37), and *Pseudomonas aeruginosa* (13.5%, 5/37); 21.6% (8 of 37) showed polymicrobial bacteriuria. In both sexes, *E. coli* was the most common microorganism isolated (20% in males; 50% in females).

Indicators of the patient's nutritional status, including BMI, serum albumin, total cholesterol, total lymphocyte count, and hemoglobin, was poorer among subjects with asymptomatic bacteriuria, but was not statistically significant. In addition, subjects with asymptomatic bacteriuria showed higher rates of pyuria and positive nitrite tests, but these also were not statistically significant (Table 2).

Discussion

Asymptomatic bacteriuria is common in the elderly, especially those who are institutionalized. The prevalence of asymptomatic bacteriuria in the institutionalized elderly population without indwelling bladder catheters was 25–50% for women and 15–40% for men.¹¹ In a census survey, approximately 85% of subjects with a long-term indwelling bladder catheter may present with asymptomatic bacteriuria.¹² The prevalence of asymptomatic bacteriuria increased progressively with age in both sexes: 15–20% in women and 0–3% in men

Table 1. Comparisons of demographic data between institutionalized Chinese elderly with asymptomatic bacteriuria and normal counterparts*

	Asymptomatic bacteriuria (n = 37)	No bacteriuria (n = 27)	p
Mean age, yr	77.8 ± 8.3	74.0 ± 9.7	0.092 [†]
Female	18 (75.7)	14 (52.1)	0.093 [†]
Functional dependence	35 (94.6)	25 (92.6)	0.57 [§]
Long-term indwelling bladder catheter	8 (21.6)	4 (14.8)	0.49 [§]
Previous UTI-related admission	5 (13.5)	4 (14.8)	0.88 [§]

UTI = urinary tract infection.

*Data are expressed as mean ± SD and number of subjects (percentage). Comparisons between groups were performed using [†]Student's t test, [‡]Chi-square test and [§]Fisher's exact test.

Table 2. Comparisons of nutritional status and urinalysis between institutionalized Chinese elderly with asymptomatic bacteriuria and normal counterparts*

	Asymptomatic bacteriuria (n = 37)	No bacteriuria (n = 27)	p
BMI, kg/m ²	19.3 ± 3.9	21.4 ± 3.5	0.066 [†]
Albumin, mg/dL	3.8 ± 0.4	3.9 ± 0.4	0.60 [†]
Cholesterol, mg/dL	187.1 ± 40.5	166.2 ± 37.0	0.078 [†]
Total lymphocyte count/mm ³	1,716.7 ± 576.4	1,579.0 ± 628.0	0.46 [†]
Hemoglobin, gm/L	13.0 ± 1.4	13.4 ± 1.5	0.36 [†]
Pyuria, WBC > 5/HPF	26 (70.3)	17 (63.0)	0.55 [†]
Positive nitrite	20 (54.1)	9 (33.3)	0.10 [†]

BMI = body mass index; WBC = white blood cell; HPF = high-power field.

*Data are expressed as mean ± SD and number of subjects (percentage). Comparisons between groups were performed using [†]Student's t test and [‡]Chi-square test.

aged 65–70 years, and 20–50% in women and 5–20% in men older than 80 years.¹³ Among the institutionalized elderly, the presence of asymptomatic bacteriuria was associated with the diagnosis of dementia, urinary or bowel incontinence, bedridden status, and longer institutional stay.⁶ In our study, the prevalence of asymptomatic bacteriuria was 57.8%. However, age, sex, long-term indwelling bladder catheter, functional status, and previous hospitalizations as a result of UTI were not significantly associated with asymptomatic bacteriuria. Our results were not completely consistent with previous reports, probably because of the relatively small sample size and the poorer functional impairment of the study subjects. The majority of our study subjects were heavily dependent in functional status (93.8% of study subjects had a Barthel index less than 20), which would make comparisons of functional status between groups difficult. A large-scale investigation enrolling subjects with different functional status is needed to clarify this issue.

In previous reports, *E. coli* was the most commonly isolated microorganism in women, and, in contrast, *Proteus mirabilis* was the most common microorganism in men.^{7,14–16} In our study, *E. coli* was the most commonly isolated microorganism in both sexes. The presence of polymicrobial bacteriuria was 21.6% in our study, which was consistent with previous reports of 10–25%.^{7,15} In our study, the presence of pyuria and a positive nitrite test in urine analysis were not significantly associated with positive urine bacterial culture. In a previous report, using culture-confirmed UTI as the gold standard, pyuria in urine analysis, and a positive nitrite test had only positive predictive value of 56–59% and 50–83%, respectively.¹⁷ Thus, health care professionals in LTCFs should recognize that diagnosis of UTI among the institutionalized elderly should not merely rely on routine urine analysis, and requires more clinical evaluations. Antimicrobial therapy among those subjects deserves more consideration to avoid developing antimicrobial resistance.¹⁸

Malnutrition is a risk factor that increases susceptibility to infections and severity of infections by its effects on both innate and adaptive immunity. It is also related to the presence of bacteriuria.¹⁹ Undernutrition was found in 30–60% of hospitalized or institutionalized elderly persons,²⁰ and was associated with higher mortality rate, delayed functional recovery, and medical expenditure.²¹ The nutritional status among our subjects with asymptomatic bacteriuria was poorer than among subjects without asymptomatic bacteriuria, but the difference was not statistically significant, probably because of the relatively small sample size and selection bias.

In conclusion, asymptomatic bacteriuria is common among the institutionalized Chinese elderly. *E. coli* was the most commonly isolated microorganism in both sexes. Age, sex, functional status, previous hospitalizations as a result of UTI, and nutritional status were not significantly associated with the presence of asymptomatic bacteriuria.

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