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Asymptomatic bacteriuria

Prevalence in the elderly population

Aim

To identify the prevalence of asymptomatic bacteriuria in the elderly population and to examine associated risk factors, complications and natural history, and whether treatment improves prognosis.

Methods

A literature search of MEDLINE, PubMed and the Cochrane Library was undertaken of studies published from 1980 to 2009. A total of 70 articles were identified. Emphasis was given to randomised controlled trials, review articles and more recent publications.

Results

Asymptomatic bacteriuria is common in the elderly, especially among institutionalised or hospitalised patients. Risk factors include cognitive impairment, diabetes mellitus, structural urinary tract abnormalities and indwelling catheters. Antimicrobial therapy does not result in improved survival or genitourinary morbidity and may potentially cause avoidable side effects and the emergence of resistant organisms.

Conclusion

Bacteriuria is common in functionally impaired elderly patients. In the absence of symptoms or signs of infection, routine dipstick screening and subsequent antimicrobial therapy is not recommended.

Keywords: aged; bacteriuria; asymptomatic states

Asymptomatic bacteriuria (ASB) is a common condition seen in primary care patients. This review aims to identify the prevalence of ASB in the elderly population and to examine its associated risk factors, complications and natural history, and whether treatment improves prognosis.

Methods

A literature search of MEDLINE was undertaken using the search terms 'asymptomatic bacteriuria' and 'elderly', with the limits of 'core clinical journals', 'English language', 'human', 'aged 65 and above', and 'studies published from 1980 to 2009'. This identified 54 articles. Repeating the search using PubMed with identical terms and criteria revealed an additional 14 articles. Searching the Cochrane Library database using the same terms revealed two relevant reviews. Emphasis was given to randomised controlled trials, review articles and more recent publications. Local Australian guidelines were also searched. The information obtained was then structured under the headings of: prevalence, aetiology, risk factors, diagnosis, complications, and management.

Prevalence

Asymptomatic bacteriuria is common among elderly patients in the community, residential aged care facilities and in the hospital setting. The prevalence of ASB increases with age, ranging from 0% in men aged 68–79 years to 5.4% in men aged 90–103 years in one study,[1] possibly related to reduced bactericidal activity of prostatic fluid with age.[2] This rising prevalence is even more pronounced in women, increasing from 13.6% to 22.4% in the corresponding age bracket.[3] This may be due to reduced oestrogen and increased vaginal pH from lack of lactobacilli colonisation postmenopause, thereby predisposing women to colonisation by uropathogens.[2]

Asymptomatic bacteriuria is also more common in institutionalised patients, with greater functional impairment compared to community dwellers (25–50% of women, 15–35% of men in institutionalised care),[4] and in hospitalised elderly patients (32–50% of women, 30–34% of men).[1] It is also common among stroke patients, with ASB found in 11.8% of subacute and chronic stroke patients.[5]

Aetiology

Asymptomatic bacteriuria is usually caused by normal flora of the gut, which then ascends up the urethra into the bladder and potentially the kidneys. The commonest causative organism is *Escherichia coli*. Other frequently isolated organisms include Gram negative bacteria such as *Klebsiella pneumonia* and *Proteus mirabilis*, and increasingly, Gram positive organisms such as *Enterococcus faecalis*, coagulase negative Staphylococcus and group B Streptococcus. Among institutionalised patients, *P. mirabilis* is most frequently isolated,[6] and for patients with long term urinary catheters, polymicrobial bacteriuria is common, often including *Pseudomonas aeruginosa*, *Morganella morganii* and *Providencia stuartii*.[7]

Risk factors

Several factors are postulated to be associated with increased ASB (*Table 1*). Structural urinary tract abnormalities such as the presence of renal calculi are thought to predispose bacteriuria by causing irritation and inflammation of the urinary tract mucosa, restricting urinary flow which leads to stasis and obstruction.[2]

Comorbid conditions such Alzheimer dementia, Parkinson disease and cerebrovascular disease may also potentially predispose to ASB through their adverse effects on bladder motility and continence.[8] Diabetes mellitus also increases the risk of ASB by potentially causing neurogenic bladder, diabetic microangiopathy and impaired immune system from hyperglycaemia.[2] Primary biliary cirrhosis, for a reason that is yet to be fully understood, also increases the risk of ASB (annual incidence 35%).[9]

A high postvoid residual (PVR) volume may also contribute, with a PVR >180 mL in asymptomatic men having 87% positive predictive value and 94.7% negative predictive value of a positive urine culture.[10] A subsequent prospective study confirmed that a higher mean PVR is associated with urinary tract infection in asymptomatic male patients.[11]

The presence of an indwelling catheter, especially long term, has been shown to independently increase risk of ASB, with a prevalence of 9–23% in short term catheterisation and 100% in long term catheterisation (>30 days).[12]

In a study of community dwelling elderly, urinary incontinence (OR: 2.99, 95% CI: 1.60–5.60), reduced mobility (OR: 2.68, 95% CI: 1.42–5.03) and oestrogen treatment (OR: 2.20, 95% CI: 1.09–4.45) were factors that were independently associated with ASB.[13] It remains unclear however, if these factors had any direct causal effect on ASB or if they were only associations. In particular, oestrogen therapy may have been prescribed in these patients in an attempt to prevent recurrent symptomatic urinary tract infection, hence the association found between ASB and oestrogen treatment.

Chronic constipation is also a risk factor for lower urinary tract symptoms, and possibly ASB, likely due to its potential to induce progressive neuropathy in the pelvic floor and causing urinary retention. A 9 year follow up study has shown a clinically significant association between constipation and urinary incontinence (OR: 1.46, 95% CI: 1.34–1.58).[14] Chronic constipation can also lead to overflow faecal incontinence and perineal soiling which further increases the risk of bacteria ascending up the urinary tract and causing infection.[15] Constipation is also a risk factor for purple urine bag syndrome, a rare phenomenon occurring typically in elderly catheterised female patients. Although this phenomenon can be associated with urinary tract infection, it responds well to antimicrobial therapy and changing of the collecting bag.[16]

Table 1. Factors associated with the presence of asymptomatic bacteriuria

Physiological	Pathological
Age	Neurological disease, eg. Alzheimer disease, Parkinson disease, stroke
Gender (female more than male)	Diabetes mellitus, primary biliary cirrhosis
	Reduced mobility
	Urinary tract abnormality (eg. calculi, prostate enlargement, high PVR volume)
	Indwelling urinary catheter
	Constipation

Table 2. Diagnosis of asymptomatic bacteriuria based on IDSA guidelines[7]

Lack of signs and symptoms of urinary tract infection
Diagnosis based on urine specimen collected in manner that minimises contamination
For asymptomatic men – single voided urine specimen with one bacterial species isolated in quantitative count ≥100 000 cfu/mL
For asymptomatic women – two consecutive voided urine specimens with isolation of same bacterial strain in quantitative counts ≥100 000 cfu/mL
For men or women – single catheterised urine specimen with one bacterial species isolated in quantitative count ≥100 cfu/mL

Diagnosis

Despite guidelines (*Table 2*), making a diagnosis of ASB, and hence deciding not to prescribe antibiotic treatment, is challenging in clinical practice, especially in elderly patients. Many elderly patients, whether due to language barriers or cognitive impairment, are unable to give a reliable history. They also frequently have multiple comorbid conditions with nonspecific systemic manifestations such as lethargy, weakness and loss of appetite, and hence it is often difficult to ascertain if these symptoms are due to bacteriuria.

This difficulty is especially true for residents of long term care facilities. A qualitative survey conducted in Canada found there are multiple triggers for ordering a urine culture, many of which were nonspecific symptoms such as increased irritability, aggressiveness and, 'not being themselves'. Physicians frequently rely on the judgment of nursing staff when making a decision whether or not to order a urine culture. However, some of the information that the decisions were based on was often incomplete or unreliable due to staff working hours and poor documentation of patients' histories.[17]

In addition, due to language barriers or cognitive impairment, elderly patients are often unable to produce clean-catch urinary samples, resulting in contaminated and difficult to interpret samples.[18] Other signs of infection such as fever and leukocytosis is found less commonly in elderly patients, therefore the absence of leukocytosis does not reliably exclude the presence of infection.[19]

Urine dipstick is not a good diagnostic

Table 3. IDSA grades of recommendation[7]

A–I: Good evidence to support recommendation for use; should always be offered and evidence is from more than one properly randomised controlled trial
A–II: Good evidence to support recommendation for use; should always be offered and evidence is from more than one well designed nonrandomised clinical trial, case control or cohort study, multiple time series study, or dramatic results from uncontrolled experiments
A–III: Good evidence to support recommendation for use; should always be offered and evidence from opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees
B–I: Moderate evidence to support a recommendation for use; should generally be offered and evidence from more than one properly randomised controlled trial

test for ASB or cystitis. Urine dipstick is useful as a 'rule out' test of urine infection if nitrate and leukoesterase are both negative. However, positive leukoesterase correlates with the presence of bacteriuria in only 50% of patients.[20] The presence of pyuria is also neither a sensitive nor specific predictor of bacteriuria in the elderly; no bacteriuria is found in 52% of elderly ambulating women with pyuria.[21] For catheterised patients, the role of pyuria in diagnosing bacteriuria and urinary tract infection is even less impressive with specificity of only 37%.[22]

Given the poor diagnostic accuracy of the urine dipstick, some authors have investigated the value of testing for urinary cytokines, given their roles in regulating inflammatory response to infection. Rodhe et al[23] found that IL-6 level has 81% sensitivity (95% CI: 54–95) and 96% specificity (95% CI: 77–100), while measurement of leukocyte esterase has 88% sensitivity (95% CI: 60–98) and 79% specificity (95% CI: 57–92). This however needs to be confirmed in larger trials and is not widely available.

Complications

Although an early study of elderly aged care residents showed that ASB is associated with reduction in survival of 30–50% over 10 year follow up,[24] a more recent observational study failed to replicate this, instead concluding that there was no significant difference in 9 year mortality among women with ASB and those without.[25] In men, although the presence of ASB was previously shown in one study to be associated with increased frequency of cancer, ASB itself was not shown to increase mortality.[26]

It also remains unproven if ASB causes increased morbidity. For example, a recent study of 644 women with diabetes mellitus, after adjustment for confounders, found no association between ASB and reduced creatinine clearance and new onset hypertension after 6 years follow up.[27]

While it has been shown that there is some association between ASB and acute cystitis in postmenopausal women,[28] and with incidence of urosepsis requiring hospitalisation in diabetic patients,[29] there remains no proven benefit of antimicrobial treatment. Even though antibiotics are effective in reducing subsequent positive urine cultures, this does not translate to reduced mortality and genitourinary morbidity, including continence status.[25,30–33] Instead, because of a lack of adherence to treatment in the elderly, treatment failures and emergence of resistant organisms is common.

In addition, it has been suggested in a small Swedish study, that the presence of a strain of *E.coli* bacteriuria may be protective from recurrent urinary infection as measured by the number of episodes of urinary infection and delay in time to infection.[34]

Management

In its 2005 guideline, the Infectious Disease Society of America (IDSA) recommended against routine screening for, and antimicrobial treatment of, ASB in elderly, community dwellers or the institutionalised. Antibiotics are also not recommended for patients with indwelling catheters, diabetic women, and any patients with spinal cord injury.[7]

Unnecessary treatment can potentially cause undesirable adverse effects of antibiotic medicines, development of resistant organisms, increased risk of drug interaction from polypharmacy and around 8% risk of *Clostridium difficile* diarrhoea.[35]

Treatment however, is recommended for patients with ASB with abnormal urinary tracts and those with persistent bacteriuria 48 hours after undergoing clean intermittent catheterisation, genitourinary manipulation, or instrumentation with a high probability of mucosal bleeding.[7,36,37] Treatment is also recommended for symptomatic bacteriuria – defined as presence of bacteremia with the same organism, acute pyelonephritis, acute lower tract symptoms or catheter trauma/obstruction.[38]

Australian guidelines concur with IDSA recommendations that the screening and treatment of bacteriuria in the absence of symptoms or signs is not recommended, except in the case of pregnant women and men about to undergo urological procedures in which mucosal bleeding is expected (*Table 3–5*).[39]

In the meantime, measures are needed to prevent ASB and its resultant unnecessary treatment. Avoidance of long term indwelling catheters, insertion of catheter with sterile technique, good catheter care including early detection of blockage, and prevention of constipation with oral laxative is also recommended.[12,40] Although systemic antimicrobial agents may reduce the occurrence of bacteriuria in the first few days postcatheterisation, it is not routine due to its cost, possible side effects and emergence of resistance.

Intravaginal oestriol treatment and cranberry juice may have a role to play in prevention

Table 4. IDSA guidelines for the management of asymptomatic bacteriuria where treatment is not recommended[7]

Patient category	Strength of recommendation and level of evidence
Institutionalised elderly	A–I
Patients with an indwelling catheter	A–I
Women with diabetes	A–I
Premenopausal nonpregnant women	A–I
Community dwelling elderly	A–II
Patients with spinal cord injury	A–II

Table 5. IDSA guidelines for the management of asymptomatic bacteriuria where screening and treatment is recommended[7]

Patient category	Strength of recommendation and level of evidence
Pregnant women	A–I
Before transurethral resection of prostate	A–I
Before other urological procedure where mucosal bleeding is expected	A–III
Persistent catheter associated bacteriuria 48 hours after catheter removal	B–I

of ASB, although larger trials are needed to confirm their efficacy. Oestriol has been shown to increase vaginal colonisation of Lactobacilli and hence potentially reduce the presence of uropathogens.[41] Cranberry juice is shown to reduce incidence of bacteriuria in one study[42] and having bacteriostatic properties in another.[43] A Cochrane review has shown that cranberry products significantly reduced the incidence of urinary tract infection at 12 months (RR: 0.65, 95% CI: 0.46–0.90) compared with placebo/control. This review though failed to clarify the optimal dose and duration of cranberry products.[44] Meta-analysis of eight trials using methenamine hippurate showed possible benefit in reducing bacteriuria (RR: 0.56, 95% CI: 0.37–0.83) and symptomatic urinary tract infection (RR: 0.24, 95% CI: 0.07–0.89).[45]

In addition, education aimed at both nursing staff and physicians is important in improving knowledge of ASB and differentiating between ASB and symptomatic urinary tract infection.

Conclusion

Asymptomatic bacteriuria is common, especially in functionally impaired elderly patients with multiple medical comorbidities. In the absence of symptoms or signs of infection, routine dipstick screening and subsequent antimicrobial therapy is not generally recommended. Early recognition and management of various risk factors of ASB is very important to potentially reduce its occurrence.

Key points

- Asymptomatic bacteriuria is common in older patients with functional impairment, cognitive impairment, urinary tract abnormalities and coexisting medical conditions.
- The commonest isolated organism is *E.coli*.
- Antimicrobial treatment does not improve survival or reduce morbidity, but can cause emergence of resistant organisms and expose patients to unnecessary side effects.
- Screening and treatment of ASB is only recommended in elderly patients having urinary procedures that may cause mucosal bleeding, and in pregnant women.
- Screening and treatment of ASB is not recommended in elderly patients, patients with indwelling catheters, diabetic women and patients with spinal cord injury.

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