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ORIGINAL ARTICLE

Bacteriuria is associated with urge urinary incontinence in older women

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Abstract

Objective. To investigate the association between bacteriuria and frequency and type of urinary incontinence in elderly people living in the community. Bacteriuria and urinary incontinence are common conditions and often coexisting in this population; the authors have previously reported the prevalence of bacteriuria to be 22.4% in women and 9.4% in men. **Design.** Cross-sectional study. **Setting.** The catchment area of a primary healthcare centre in a Swedish middle-sized town. **Subjects.** Residents, except for those in nursing homes, aged 80 and over. Participation rate: 80.3% (431/537). **Main outcome measures.** Urinary cultures and questionnaire data on urinary incontinence. **Results.** In women the OR for having bacteriuria increased with increasing frequency of urinary incontinence; the OR was 2.83 (95% CI 1.35–5.94) for women who were incontinent daily as compared with continent women. Reporting urge urinary incontinence increased the risk of having bacteriuria: 3.36 (95% CI 1.49–7.58) in comparison with continent women while there was no significant association between stress urinary incontinence and bacteriuria. The prevalence of bacteriuria among men was too low to make any meaningful calculations about the association between bacteriuria and frequency and type of incontinence. **Conclusion.** Bacteriuria is associated with more frequent leakage and predominantly with urge urinary incontinence. The causes of this association and their clinical implications remain unclear. There might be some individuals who would benefit from antibiotic treatment, but further studies are warranted.

Key Words: Bacteriuria, elderly, family practice, stress urinary incontinence, urge urinary incontinence

Urinary incontinence is a common condition in elderly people, causing discomfort for the individual [1,2] and societal costs. The prevalence of urinary incontinence among persons aged 80 and over is reported to be 35–40% for women and 20–30% for men. Even higher figures are reported depending on definitions used and differences in populations studied [3–7].

Asymptomatic bacteriuria (ASB) is another common condition. Prevalences for women aged 80 and over are between 20% and 40%, the highest figures being for those in institutional living [8–10]. ASB is regarded as a mostly harmless condition, for which there is a consensus not to treat with antibiotics [11,12]. Some studies have indicated an association between ASB and urinary incontinence [9,13,14]. The nature of this association is still unclear.

Bacteriuria and urinary incontinence are common and often coexisting among elderly people, creating diagnostic and therapeutic problems for the practitioner.

- Among elderly women living in the community, bacteriuria was associated with frequent leakage and predominantly with urge urinary incontinence.
- The causes of this association and their clinical implications remain unclear.

In a population of people aged 80 and over residing outside institutional care, we identified bacteriuria (first culture positive) in 22.4% of women and in 9.4% of men. ASB (defined as two positive cultures of the same species in two consecutive samples) was

found in 19.0% of women and in 5.8% of men. In women, urinary incontinence weekly or more often, reduced mobility and the use of oestrogen was independently associated with ASB [15].

The aim of the present study was to investigate the relation between bacteriuria and the extent and type of urinary incontinence.

Material and methods

Study population

The study was carried out in the geographical catchment area of Britsarvets primary healthcare centre in Falun, Sweden, during the period March to June 2003. All registered residents aged 80 and over, except for those 5–10% who lived in nursing homes, were invited to participate in the study. Of those invited ($n=577$), we excluded 30 (5.2%) who were unable to provide a urine sample, owing to poor mental and/or physical status, nine (all men) with an indwelling catheter, and one woman with an obvious symptomatic urinary tract infection. Of the 537 eligible individuals, 105 (18.2%) declined to participate and in one case there was no information on urinary incontinence. The number of participants accordingly ended up at 431 (participation rate: $431/537=80.3\%$). Median age was 84 years and 68% were women.

Questionnaire

After obtaining informed consent, a home visit was arranged by the study nurse for interviews and collection of urine samples.

The question defining urinary incontinence was: "Do you suffer from involuntary urine leakage?" The incontinence was classified according to frequency (seldom, at least once a month, at least once a week, or daily) and type. Stress urinary incontinence was defined as a positive answer to the question: "Do you have urinary leakage during exertion (e.g. coughing or sneezing)?" Urge urinary incontinence was defined as answering yes to the question: "Do you have urinary leakage associated with a sudden desire to pass urine?" This is in accordance with the accepted definition of urge urinary incontinence: "The complaint of involuntary leakage (of urine) accompanied by or immediately preceded by urgency" [16]. Subjects who answered yes to both questions were classified as mixed urinary incontinent and subjects who answered yes to the opening question but gave no answer to the second question as unclassified urinary incontinent.

When relating incontinence to bacteriuria, the number of categories was reduced by putting "seldom" together with "at least once a month". Very

good reproducibility of the question defining urinary incontinence was found in a previous study [17], and the definitions are close to those used by Hannestad [3].

Reduced mobility was defined as not being able to walk indoors without support. Using only a stick was considered normal mobility. Use of oestrogen was either topical or systemic.

Urine samples

Bacteriuria was defined as growth of $\geq 10^8$ CFU/litre ($\geq 10^5$ CFU/ml). Cultures with mixed flora or growth of $<10^8$ CFU/litre were regarded as negative. In order also to satisfy the strict definition of ASB there was, if the first culture was positive, a second sample taken within 1–2 weeks. ASB is defined as growth of $\geq 10^8$ CFU/litre of the same species in two consecutive urine samples *without* symptoms from the urinary tract. However, this definition might be difficult to apply to an elderly population among whom minor, non-acute urogenital symptoms are common [4,18]. In this paper we therefore chose to use bacteriuria as a neutral term.

Statistical analysis

Software used was SPSS for Windows, Rel. 14.0.0, 2005. Proportions were compared using chi-squared test, and a logistic regression technique was used to determine the odds ratios and their 95% confidence intervals for bacteriuria with different frequencies and types of urinary incontinence and to adjust for mobility and oestrogen use. As frequency and type of incontinence partly measure the same thing, the R-value between them being 0.74, we carried out the multivariate analyses separately for these two different classifications of incontinence.

Results

Table I shows the frequency and type of urinary incontinence and the relation to bacteriuria in women and men. Some level of involuntary leakage of urine was reported by 64.5% of the women and by 46.4% of the men. Less frequent incontinence was mostly of stress type in women and of urge type in men. When incontinence occurred at least weekly, mixed urinary incontinence was the most common type for both men and women. The prevalence of bacteriuria increased from 14% among continent women to 39% among those who were incontinent daily while the corresponding figures for men were 7% and 25% respectively. More than one-third of women with urge or mixed incontinence had bacteriuria.

Table I. Frequency and type of urinary incontinence and the occurrence of bacteriuria in women (n = 293) and men (n = 138).

	Women		Men	
	n (% of all)	Bacteriuria within group n (%)	n (% of all)	Bacteriuria within group n (%)
Frequency:				
No leakage	104 (35.5)	15 (14.4)	74 (53.6)	5 (6.8)
Leakage seldom	77 (26.3)	14 (18.2)	33 (23.9)	2 (6.1)
Leakage monthly	11 (3.8)	0 (0)	3 (2.2)	0 (0)
Leakage weekly	23 (7.8)	7 (30.4)	4 (2.9)	0 (0)
Leakage daily	78 (26.6)	30 (38.5)	24 (17.4)	6 (25.0)
Type:				
When some urinary leakage:				
Stress incontinence	50 (17.1)	7 (14.0)	4 (2.9)	1 (25.0)
Mixed incontinence	65 (22.2)	19 (29.2)	17 (12.3)	3 (17.6)
Urge incontinence	52 (17.7)	21 (40.4)	33 (23.9)	3 (9.1)
Unclassified	22 (7.5)	4 (18.2)	10 (7.2)	1 (10.0)
When leakage at least weekly:				
Stress incontinence	16 (5.5)	5 (31.3)	3 (2.2)	1 (33.3)
Mixed incontinence	47 (16.0)	15 (31.9)	14 (10.1)	3 (21.4)
Urge incontinence	30 (10.2)	14 (46.7)	9 (6.5)	1 (11.1)
Unclassified	8 (2.7)	3 (37.5)	2 (1.4)	1 (50.0)

The odds of having bacteriuria was 3.7 for women with leakage daily as compared with continent women (Table II), and there was a trend towards higher odds with increasing frequency of incontinence ($p = 0.0006$). The OR was also higher for women with urge and mixed urinary incontinence than for women with stress urinary incontinence, although the differences were not significant. The ORs were similar after adjustment for reduced mobility and use of oestrogen. The associations with frequency and type of urinary incontinence remained even when the stricter definition of ASB (two positive cultures) was used.

The prevalence of bacteriuria among men was too low to make any meaningful calculations about the association between bacteriuria and frequency and type of incontinence.

Discussion

Main findings

In women, the odds for having bacteriuria increased with frequency of incontinence. Urge incontinence was significantly associated with bacteriuria, while stress incontinence was not.

Table II. Associations of bacteriuria and ASB (two positive cultures) with frequency and type of urinary incontinence in women (n = 293).

	Bacteriuria	Bacteriuria	ASB
	Adjusted for mobility and oestrogen use		
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Frequency:			
No leakage	1.00	1.00	1.00
Leakage seldom	1.12 (0.51–2.48)	0.92 (0.41–2.09)	1.14 (0.47–2.78)
Leakage weekly but not daily	2.60 (0.92–7.37)	2.09 (0.68–6.38)	2.45 (0.75–7.96)
Leakage daily	3.71 (1.82–7.56)	2.83 (1.35–5.94)	3.52 (1.58–7.87)
Type:			
No leakage	1.00	1.00	1.00
Stress incontinence	0.97 (0.37–2.54)	0.82 (0.30–2.26)	1.21 (0.42–3.45)
Mixed incontinence	2.45 (1.14–5.27)	1.86 (0.83–4.16)	2.16 (0.90–5.17)
Urge incontinence	4.02 (1.85–8.76)	3.36 (1.49–7.58)	4.15 (1.74–9.88)
Unclassified	1.32 (0.39–4.44)	0.75 (0.20–2.76)	0.81 (0.19–3.45)

Comments on method

The studied population consisted of all individuals, except for those living in nursing homes, aged 80 and over, living in a specific geographical area, able to provide a urine sample, and without an indwelling catheter. The participation rate was high, 80.3%, the demographic data of those living in the area were close to the average in Sweden, and the non-participants did not differ in terms of age, sex, or rate of care consulting from the participants [15]. We therefore regard the present sample as representative of a Swedish community-living population aged 80 and over. Small subgroups resulted in low power and wide confidence intervals, yet some important associations between bacteriuria and incontinence were found in women. However, the population was too small with regard to men to make any calculations of such associations.

In some cases, urinary incontinence may represent a symptomatic urinary tract infection. Therefore, we found it more relevant to use the term bacteriuria than asymptomatic bacteriuria, hence accepting *one* positive culture for a positive outcome. On the one hand this increases the risk of including contamination as a positive culture, but on the other hand some episodes of bacteriuria are short and transient and are probably missed when using the strict definition of ASB (two positive cultures) [19]. Using bacteriuria instead of ASB gives us a more clinical approach to the problem – in our practice we have only one culture on which to base our judgement. It is important to note that our study was cross-sectional, thus not providing evidence of causal relationships.

Comments on results

Prevalences of urinary incontinence and bacteriuria. Our prevalence figures for bacteriuria confirm the few previous findings from similar populations [8,10].

The prevalence of urinary incontinence varies greatly between studies, depending on population, definition of urinary incontinence, and the way questions are formulated [20]. According to the International Continence Society, urinary incontinence is defined as “the complaint of any involuntary leakage of urine” [16] although many studies use definitions such as leakage monthly/weekly or more often. Our findings on the prevalence of urinary incontinence weekly or more often, 20% among men and 34% among women, are almost identical with findings in a study from the Netherlands [7].

Almost 30% of women with some leakage reported stress urinary incontinence, which is in

concordance with the findings of a Norwegian study [3]. The most common type of urinary incontinence among men in our population was urge incontinence while stress incontinence was less common. This is in accordance with findings from a recent study from Finland [6]. Regarding frequency of incontinence, individuals with stress urinary incontinence reported less frequent leakage than those with urge and mixed type, a finding that is consistent with those of other studies [20].

Associations between urinary incontinence and bacteriuria in women. Others have also found an association between urinary incontinence and bacteriuria [9,13,14] although those studies have mainly focused on people in institutional settings. As far as we know, there are no previous studies on the presence of bacteriuria in relation to frequency and type of incontinence.

The causes of the association between urinary incontinence and bacteriuria are not clear. In this age group, there is probably not an absolute and distinct boundary between normal variations in mild urogenital sensations and symptoms caused by urinary tract infections, and some individuals might in reality suffer from symptomatic cystitis. An alternative explanation for the association between bacteriuria and incontinence is that both conditions have a common cause in bladder dysfunction and/or mucosal atrophy. This hypothesis is supported by the finding that treating bacteriuria had no effect on the severity of chronic urinary incontinence among nursing home residents [21], and that treatment did not affect symptoms of urinary tract infection in ambulatory elderly subjects [12], nor has an association between bacteriuria and long-term morbidity or mortality been demonstrated [22].

The finding that urge urinary incontinence but not stress urinary incontinence was associated with bacteriuria in women may be due to a *real* difference between the two types explained by differences in anatomy, physiology, and pathogenesis. The finding may also be explained in terms of the strong association between the frequency of incontinence and bacteriuria, as stress urinary incontinence was characterized by less frequent urine loss than urge urinary incontinence. Bacteriuria may stimulate frequent leakage *or* frequent leakage may facilitate bacterial ascent.

The WHI study revealed a strong association between urinary incontinence and the use of conjugated equine oestrogen among postmenopausal women [23]. In Sweden it is uncommon to use this kind of oestrogen for women aged 80 or over and the oestrogen used in the present study was probably

exclusively oestriol or topical low-dose oestrogen. The association between the use of oestrogen and bacteriuria could possibly be explained by the fact that older people with bacteriuria seem to have an increased risk of being diagnosed with recurrent symptomatic urinary tract infections [22], and oestrogen is often used in an attempt to prevent these infections.

Clinical implications

The causes of the association found between bacteriuria and urinary incontinence in women in this cross-sectional study are unclear. There is currently no support for antibiotic treatment when bacteriuria is accidentally found in an elderly woman with urinary incontinence. However, there might be a subgroup among patients suffering from urge or mixed urinary incontinence or frequent incontinence and bacteriuria who could benefit from such treatment. A prospective placebo-controlled study is needed to obtain evidence of possible benefits.

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Conflicts of interests: none.

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