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Research paper

Recurrent urinary tract infection in females is a benign disease



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ABSTRACT

Background: Little is known about long-term consequences of recurrent urinary tract infections although 60% of women develop urinary tract infection during their lifetime and 20–40% of them have a recurrence.

Objective: To study the role of recurrent urinary tract infections in mortality or development of kidney dysfunction or hypertension in women.

Design: Retrospective analysis of prospective, population-based 20-year follow-up study.

Setting: Community.

Subjects: A birth cohort of 764 older females living in the defined geographical area in Southwestern Finland who were 70 years old at baseline.

Methods: The participants were examined and interviewed to assess health history, health behaviors, cardiovascular risk factors, morbidity and physical, social and psychocognitive functioning at the age of 70, 80, 85 and 90 years between 1991–2011.

Results: Recurrent urinary tract infections in females were not associated with increased mortality, development of hypertension or kidney dysfunction. Urinary incontinence predisposed females to receive antimicrobial treatment for recurrent urinary tract infections.

Conclusions: The results indicate that recurrent urinary tract infection in females is a benign disease in the absence of abnormalities of the urinary tract even in the older population.

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1. Introduction

Recurrent urinary tract infection refers to at least 2 infections in 6 months or 3 or more infections in one year. Most recurrences are thought to represent reinfection rather than relapse [1]. The pathogenesis of recurrent urinary tract infection in females is assumed to be the same as with sporadic infection. However, several host genetic, biologic, and behavioural factors appear to predispose young healthy women to uncomplicated urinary tract infections [2]. The strongest and most consistent risk factor of urinary tract infection for postmenopausal women is a history of urinary tract infection at a younger age. Urinary tract infections in postmenopausal women are also consistently associated with chronic incontinence [2,3].

A single acute cystitis is benign from the perspective of long-term outcomes. Acute infections including urinary tract infections

are, however, associated with a transient increase in the risk of vascular events in outpatients [4]. Nosocomial urinary tract infections increase morbidity in nursing homes [5]. We investigated if recurrent urinary tract infections have a role in mortality or in the development of kidney dysfunction or hypertension in women.

2. Methods

2.1. Study design and population

All community-living older females at the specified age and living in the defined geographical area ($n = 764$), were offered the possibility to participate a survey investigating the health of older people in the city of Turku, Southwest Finland. The participants were 70 years old at baseline and the follow-up time was 20 years (1991–2011). Eighty-six percent of them returned the questionnaire and participated in clinical examination. They were considered eligible for the follow-up (Fig. 1). To investigate the

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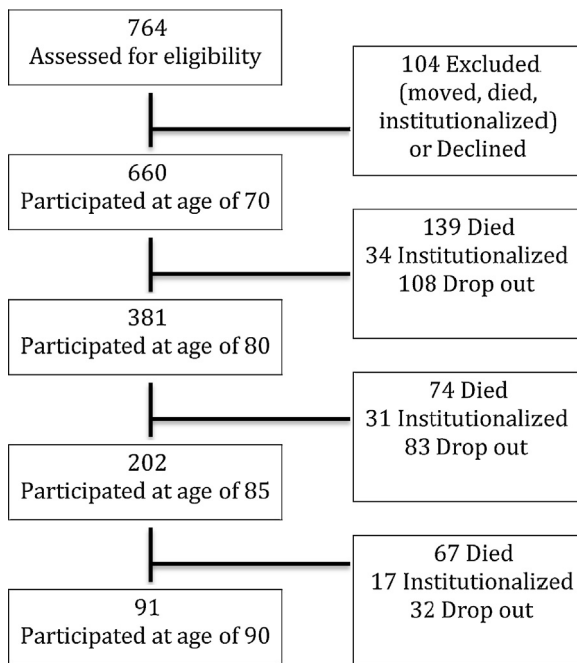


Fig. 1. Flow chart of the participants.

determinants of successful aging, the participants were examined and interviewed at the age of 70 ($n = 660$), 80 ($n = 381$), 85 ($n = 202$) and 90 ($n = 91$) years to assess health history, health behaviors, cardiovascular risk factors, and physical, social and psychocognitive functioning. Incident cognitive impairment was ascertained on clinical interviews with the Mini-Mental State Examination (MMSE) as a screening instrument [6]. All eligible participants signed a written informed consent and the study protocol was approved by the ethical committee of the Hospital District of Southwest Finland.

2.2. Diagnosis of recurrent urinary tract infection and hypertension

In mailed questionnaires, we asked the participants whether recurrent urinary tract infections have ever been diagnosed. We also asked detailed information about previous and current diseases. Hypertension was defined either as a clinical diagnosis or the use of antihypertensive medication. Hypertensive participants were referred to a physician at the baseline examination in 1991 ensuring the diagnosis and treatment of high blood pressure.

2.3. Determination of kidney function

Serum creatinine of the 70, 80, 85 and 90 years old participants was measured immediately after the samples were drawn. The original enzymatic creatinine values measured 1991 were recalibrated providing isotope dilution mass spectrometry traceable values. Glomerular filtration rate was estimated using an equation developed by the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) [7].

2.4. Mortality

Time and cause of death of deceased participants were ascertained from the national Death Register kept by Statistics Finland. The register covers information on all death certificates of Finnish citizens, and assures complete coverage. A unique national personal identification number assigned to every permanent resident of the country was used in the computerised record linkage.

2.5. Statistical analysis

In statistical analysis we used descriptive statistics, cross tabulation with Fisher's exact test, analysis of variance and Kaplan-Meier survival curves with log-rank test. Our statistical packages were NCS 2007 NCS 8 (Hintze, J. 2012, Kaysville, UT, USA) and SPSS 16.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Cognitive function of the participants was relatively stable during the 20-year follow-up time. The mean MMSE (\pm SD) values of the 70, 80, 85 and 90-year old females were 26.9 ± 2.5 , 25.7 ± 3.0 , 25.3 ± 3.3 and 27.2 ± 2.9 respectively.

Fig. 2 shows that the mean estimated glomerular filtration rate was about $60 \text{ mL/min/1.73 m}^2$ corresponding to a moderately reduced kidney function. The prevalence of hypertension increased from 36% to about 70% during the 20-year follow-up time.

3.1. Prevalence of recurrent urinary tract infection

Twenty-two percent of the women had had one or more episodes of recurrent urinary tract infection by the age of 70 years and the diagnosis became more prevalent during the follow-up. Twenty-seven percent, 28% and 29% of the 80, 85 and 90 years old participants had a history of recurrent urinary tract infection, respectively. None of the females reported having urological diseases.

3.2. Recurrent urinary tract infection, morbidity and mortality

Urinary incontinence was strongly associated with urinary tract infection. Nineteen to 38 percent of the females without urinary tract infection had incontinence whereas 48–68% of the participants with recurrent infections were incontinent. A history of recurrent urinary tract infection was neither associated with the development of hypertension or kidney dysfunction nor increased mortality.

4. Discussion

In mailed questionnaires, we asked the participants whether a recurrent urinary tract infection has ever been diagnosed. In this study, recurrent urinary tract infection refers to recurrent cystitis because recurrent pyelonephritis is very rare in a population that has no urological disorders. We found that in our study, the prevalence of recurrent urinary tract infection increased with age and was comparable to other cohorts [2].

Our data on the association between urinary tract infection and urinary incontinence is consistent with previous reports [2,3]. The basis of this association is poorly understood. The etiology of urinary incontinence in older females is often multifactorial and urge and mixed types of urinary incontinence become the most prevalent types of incontinence [8,9]. These types of urinary incontinence are not typically complicated with chronic retention. It is possible that incontinent females receive antimicrobial treatment to asymptomatic bacteriuria more often than those without this problem.

There is some data on asymptomatic kidney inflammation in patients with urinary tract infection. Chronic pyelonephritis is an uncommon cause of chronic tubulointerstitial disease and kidney dysfunction due to recurrent infection. Autopsy studies have revealed the presence of kidney inflammation in some patients with long-term catheterization even without symptoms of urinary tract infection [4]. There is no data on asymptomatic kidney inflammation without predisposing factors. Our study shows that

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