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Urgency and Urge Incontinence in the Older Population

Prevalence, Associated Factors and Prognosis



ACADEMIC DISSERTATION

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ABSTRACT

Urgency and urge incontinence are major urinary symptoms in older people, with considerable quality-of-life consequences. The aim of this cross-sectional and longitudinal survey was to ascertain the prevalence, associated factors and prognosis of urgency and urge incontinence in a random older population. The data were obtained from the Tampere Longitudinal Study on Ageing (TamELSA). The response rates in the three waves were 81%, 80% and 93%, respectively. Age- and gender-specific weighting was used in the cross-sectional studies to improve the generalizability of the symptoms. The analyses were conducted mainly separately in the two genders.

In the third wave in 1999–2000 among people aged 70 years and over (N=398), urge incontinence was more prevalent than urgency alone in both men and women (24% vs 10% and 36% vs 9%, respectively). Female sex and advancing age in women increased the risk of urge symptoms. Of the men 72% and of the women 48% reported voiding symptoms ($p<0.001$). Voiding and urge symptoms were mutually associated in both genders. The prevalences of stress, urge and mixed incontinence were 2%, 17% and 6% in men and 23%, 6% and 30% in women. Adjusted for age, urge and mixed incontinence combined were associated with living in an institution, comorbidity, ADL disability, depressive mood and fecal incontinence in women and with ADL disability and depressive mood in men. All the men living in an institution were incontinent of urine. Of the incontinent women 46% and 9% of the men used diapers; male collecting devices were rare.

In the 1979 baseline material among respondents aged 60–89 (N=1059), current smokers were at greater risk of urgency (OR 2.76; 95% CI 1.43–5.32) in the combined model for men and women. In the separate models current male smokers and former female smokers were at greater risk. Alcohol use and coffee drinking were not associated with urgency.

The home-dwelling participants in the survey in 1989 (N=775) aged 60 years and over were followed up for 13 years. In men, urge incontinence remained a significant predictor of institutionalization (RR 3.07; 95% CI 1.24–7.59) in the Cox proportional hazards models adjusted for age, living arrangements, comorbidity, ADL disability and depressive symptoms. Urge incontinence in women did not predict institutionalization.

The baseline material from 1979 was used to examine the association of urgency and urge incontinence with ten-year mortality and to describe changes in symptoms among the survivors. In the Cox proportional hazards models adjusted for age, chronic diseases, ADL disability, socioeconomic status, smoking and alcohol use, urgency and urge incontinence in men (RR 1.80; 95% CI 1.20–2.71, and RR 1.97; 95% CI 1.25–3.10, respectively) remained significant predictors of mortality. In women, urge incontinence predicted death only when adjusted for age. Women were more likely to develop urge incontinence than men, with an IPR 3.47 (95% CI 1.94–6.21). True incidence or remission rates could not be calculated by reason of the high mortality rate.

In conclusion, urgency and urge incontinence are significant multifactorial symptoms in older people and are associated with a poor long-term prognosis in men. An individual multidisciplinary approach is recommended in the evaluation and management of urinary symptoms in older people in order to improve the quality of life and urologic health in ageing populations.

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LIST OF ORIGINAL ARTICLES

This study is based on the following original publications, referred to in the text as I–V:

- I Nuotio M, Jylhä M, Luukkaala T, Tammela TLJ (2002): Urgency and urge incontinence and voiding symptoms in men and women aged 70 years and over. *BJU Int* 89:350–355.
- II Nuotio M, Jylhä M, Luukkaala T, Tammela TLJ (2003): Urinary incontinence in a Finnish population aged 70 and over. Prevalence of types, associated factors and self-reported treatments. *Scand J Prim Health Care* 21:182–187.
- III Nuotio M, Jylhä M, Koivisto AM, Tammela TLJ (2001): Association of smoking with urgency in older people. *Eur Urol* 40:206–212.
- IV Nuotio M, Tammela TLJ, Luukkaala T, Jylhä M (2003). Predictors of institutionalization in an older population during a 13-year period: The effect of urge incontinence. *J Gerontol Med Sci* 58A:756–762.
- V Nuotio M, Tammela TLJ, Luukkaala T, Jylhä M (2002). Urgency and urge incontinence in an older population: Ten-year changes and their association with mortality. *Aging Clin Exp Res* 14:412–419.

ABBREVIATIONS

ADL	Activities of daily living
BPH	Benign prostatic hyperplasia
BOO	Bladder outlet obstruction
BPE	Benign prostatic enlargement
CI	Confidence interval
ELSA	European Longitudinal Study on Ageing
GDS	Geriatric Depression Scale
ICS	International Continence Society
IPR	Incidence proportional ratio
LUTS	Lower urinary tract symptoms
OR	Odds ratio
RR	Relative risk
TamELSA	Tampere Longitudinal Study on Ageing

INTRODUCTION

While being recognized as one of the "geriatric giants", with considerable quality-of-life and economic consequences (Naughton and Wyman 1997, Wilson et al. 2001), urinary incontinence among older people has remained a much neglected field in our health and social care system. Older people themselves may not only feel too embarrassed to open discussion on the subject but may regard urinary incontinence as a normal part of ageing (Mittiness 1990, Branch et al. 1994, Dugan et al. 2001). Health and social care professionals, on the other hand, may have adverse attitudes towards or simply lack sufficient knowledge of the problem and means of treating it (Mittiness 1990, McDowell et al. 1994). Thus, even if identified, urinary incontinence is commonly left untreated. At the same time, various treatment options for urinary incontinence are currently being developed, among them medical, surgical and behavioural therapies and their combinations. Moreover, contrary to common misconceptions, continence, when well targeted, can be promoted even among the most frail older people (Brandeis et al. 1997, Fonda et al. 1998a, Ouslander 2002).

We are living in a rapidly ageing society. The proportion of people in Finland aged 65 years and over was 14.9% by year 2000 and that of people aged 74 years and over 6.5% while the proportion of people aged 85 years and over was 1.5% (Tilvis 2001). By year 2010 the corresponding figures are expected to be 17.2%, 7.6% and 1.8%, respectively. The most marked increase is expected to take place in the proportion of the oldest old. Given that the prevalence of urinary incontinence and other lower urinary tract symptoms (LUTS) increases with advancing age (Hunnskaar et al. 2000, Milsom et al. 2001), more attention is clearly called for on the part of the health and social care system in meeting the problems this development will present.

Older people with urinary problems differ from younger subjects in that a variety of age-related disease conditions and disabilities may contribute to the symptoms, together with ageing-related changes in the lower urinary tract in men and women. There is thus a clear need for reliable epidemiological data on urinary incontinence and other LUTS in older people.

This cross-sectional and longitudinal survey was undertaken to examine the prevalence, associated factors and prognosis of urgency and urge incontinence in a random older population including both community-dwelling and institutionalized people of the two genders. The data for the study were derived from all three waves of the Tampere Longitudinal Study on Ageing (TamELSA), which was initiated in 1979 and now consists in a 20-year follow-up.

REVIEW OF THE LITERATURE

Urinary incontinence has long been acknowledged to constitute a major health problem in older people and it has been widely discussed in the geriatric and epidemiological literature. Recently, the concept of the overactive bladder or the urge syndrome has been introduced to define the most important manifestation of urinary continence problems in older people (Ouslander et al. 2000). According to the currently revised terminology for lower urinary tract function by the International Continence Society (ICS), urgency and urge incontinence are the key symptoms of the syndrome (Abrams et al. 2002). The present study aimed to focus on those symptoms. While the following review deals with the overall problem of urinary incontinence, available studies involving urgency and urge incontinence are discussed and referred to.

1 Definitions of urgency, urge incontinence and other lower urinary tract symptoms (LUTS)

In addition to urgency and urge incontinence, older people may evince a variety of other LUTS either singly or in combinations with urge symptoms. Since the present study also assessed those LUTS related to urgency and urge incontinence, the current definitions for the most prominent other LUTS are also reviewed in the following.

The currently revised standardization of terminology by the ICS emphasizes LUTS as subjective indicators of a disease or change in condition as perceived by the patient or described by the caregiver (Abrams et al. 2002). The symptoms can be volunteered or described during the patient interview. However, LUTS cannot be used as a basis for a definitive diagnosis and may in fact indicate pathologies other than lower urinary tract dysfunction. In the following, the revised definitions of LUTS by the ICS are summarized.

LUTS are further divided into storage, voiding and post-micturition symptoms according to the phase of the micturition cycle during which they are experienced.

1.1 Storage symptoms

Urinary incontinence is defined as any involuntary leakage of urine. Urgency is a complaint involving a sudden compelling desire to pass urine which is difficult to defer, and urge incontinence involuntary leakage accompanied by or immediately preceded by

urgency. In addition to the key symptoms of urgency and urge incontinence, increased daytime frequency and nocturia usually accompany the overactive bladder syndrome. However, in the new standardization of terminology by the ICS, nocturia is considered as a syndrome entity of its own (van Kerrebroeck et al. 2002). Stress incontinence is defined as an involuntary leakage of urine during physical exertion, coughing or sneezing, while mixed incontinence is a combination of the urge and stress types.

1.2 Voiding symptoms

Voiding symptoms include slow stream, intermittency, hesitancy and straining. Slow stream is reported by the individual as a perception of reduced urinary flow, usually compared to previous performance. Intermittent stream is described by the individual as a urine flow which stops and starts during micturition. Hesitancy is the difficulty to initiate micturition and straining the muscular effort to either initiate, maintain or improve urinary stream.

In addition to storage and voiding symptoms, post-micturition symptoms – the feeling of incomplete emptying and post-micturition dribble – may also occur.

2 Physiology of urinary continence

The lower urinary tract has two basic functions: the storage and the periodic elimination of urine. These functions are under complex neurological control mediated by peripheral nerves, autonomic nervous system, spinal cord and central nervous system (de Groat et al. 1999). In short and simplified, the detrusor is relaxed during bladder filling with no or only little increase in intravesical pressure, while the urethral sphincter is closed, preventing involuntary leakage. In the voiding phase, the detrusor is contracted and the urethral sphincter is opened while the outlet constitutes an unobstructed conduit.

The involuntary storage and micturition centres are located in the pons, while the voluntary control of urine storage in adults is mediated by the cerebral cortex. This higher control is by nature inhibitory and was located for the first time by Andrew and Nathan (1964) in the frontal lobe.

As summarized by Jirovec (1986), continence is achieved and maintained in the presence of an adequate stimulus to initiate the micturition reflex, neuromuscular and structural integrity of the genitourinary system, the cognitive ability to respond to the sensation of a full bladder, and the motivation to inhibit the passage of urine. In

addition, the individual must be mobile enough to be able to react to a full bladder before the urge to urinate overwhelms the inhibitive capacity. Appropriate and adequate environmental and social requirements for toileting need also to be fulfilled.

3 Pathophysiology of urinary incontinence in old age

The pathophysiology of urinary incontinence is complex, especially in old age. Furthermore, it is not possible entirely to separate the pathophysiology of urinary incontinence from other lower urinary tract dysfunction. This is taken into account in the following review.

Ageing changes in the lower urinary tract and age-related disease conditions predispose older men and women to urinary incontinence and other lower urinary tract dysfunction. These changes and disease conditions may be related to detrusor, urethral sphincter or nervous system responsible for the control over continence. Some of the reasons for dysfunction are thus common in both men and women, while some again may differentiate between the genders due to anatomical differences and pathophysiological processes related to ageing. In addition, factors outside the lower urinary tract and beyond its neurological control, for example problems in mobility or cognition, fecal impaction and environmental limitations, may negatively affect continence especially in old age (Staskin 1986, Resnick 1996, Cheater and Castleden 2000).

An overactive detrusor is the major urological dysfunction likely to be responsible for the symptoms of urgency and urge incontinence in both older men and women (Elbadawi et al. 1993b, Payne 1998). This is a urodynamic diagnosis and defining a disturbance of the storage phase of the micturition cycle involving involuntary detrusor contractions, which may be spontaneous or provoked (Abrams et al. 1988, Abrams et al. 2002). Traditionally, the condition has been further divided into detrusor hyperreflexia in cases with a neurological cause and detrusor instability in cases where no neurological cause can be identified (Abrams et al. 1988). In the ICS revision of terminology, detrusor hyperreflexia has been replaced by neurogenic and detrusor instability by idiopathic detrusor overactivity (Abrams et al. 2002).

The mechanism of an idiopathic overactive bladder is poorly understood. It has been suggested that it may develop as a result of a primary smooth muscle disease or a subclinical neurological disorder (Elbadawi et al. 1993b, Payne 1998). In fact, more detailed examinations of patients with detrusor overactivity have shown minor neurological signs (Ahlberg et al. 2002).

Cerebrovascular disorders and Parkinson's disease are typical examples of age-related conditions associated with neurogenic detrusor overactivity in terms of reduced central inhibition of the urinary bladder (Staskin 1986, DuBeau 1996, Sakakibara et al. 1996, Brittain et al. 1998). A less common but specific cause of a neurogenic overactive bladder and urinary incontinence among older people is the normal pressure hydrocephalus (NPH) syndrome (Staskin 1986, Du Beau 1996). Diabetic neuropathy, back problems and spinal cord lesions may also lead to neurogenic bladder dysfunction (Staskin 1986, DuBeau 1996).

With advancing age, the detrusor may also become underactive in both men and women (Elbadawi et al. 1993a, Resnick 1996, Elbadawi 1995). This is manifested by a voiding contraction weaker or less efficient than normal; furthermore, there is a distinctive ultrastructural degenerative pattern (Elbadawi et al. 1993a). Other ageing changes in bladder function in both sexes include reduced peak and average flow rate, voided volume and bladder capacity and a tendency to elevated residual volumes (Madersbacher et al. 1998).

Ageing-related changes in the renal and hormonal systems involved in the conservation of water and sodium may result in nocturnal polyuria, representing a clinical picture of nocturia or nocturnal enuresis (Staskin 1986, Miller 2000). Symptomatic acute lower urinary tract infection may also involve a clinical picture of new-onset urgency and urge incontinence in both sexes (Staskin 1986, Swami and Abrams 1996).

A major ageing-related disease condition of the lower urinary tract in older men is benign prostatic enlargement (BPE) due to hyperplasia (BPH). BPE may be asymptomatic but can lead to bladder outlet obstruction (BOO) and predispose the individual to storage, voiding and postmicturition symptoms (Swami and Abrams 1996, Knutson et al. 2001). Detrusor overactivity is estimated to be present in 45–80% of patients with BOO and some of these patients may have urge incontinence (Swami and Abrams 1996). Severe BOO may lead to chronic urinary retention and overflow incontinence (Johnson and Ouslander 1999).

In older women, urgency and urge incontinence may arise from urogenital atrophy due to the postmenopausal decline in estrogen (Staskin 1986). Weakness of the muscles in the pelvic floor may result in hypermobility of the bladder base and intrinsic sphincter deficiency, predisposing the individual to stress incontinence (Wagg et al. 1996, Ouslander 1997, McGrother et al. 1998). Vascular changes may also be implicated in the development of intrinsic sphincter deficiency in older women (McGrother et al. 1998).

In some cases, urinary incontinence may be iatrogenic, due to surgical procedures and medical treatments. For example, stress incontinence is a well-known consequence

of prostatectomy in men (Johnson and Ouslander 1999). It has been suggested, that hysterectomy may be a risk factor for late-life urinary incontinence in women (Hunnskaar et al. 2000). Furthermore, various pharmacological agents can contribute to incontinence and other LUTS in older people (Diokno et al. 1991, Gormley et al. 1993, Resnick 1996). Among such medications are for example psychotropic drugs with anticholinergic effects potentially leading to urinary retention and overflow incontinence or medications such as calcium channel antagonists prescribed for cardiovascular diseases, and also diuretics.

Finally, tumours, including cancer of the prostate in men, and prolapses of the lower urinary tract or adjacent pelvic structures are other possible causes of urinary incontinence, especially of the urge type, and other LUTS in older people (Staskin 1986, McGorther et al. 1998).

4 Epidemiology of urinary incontinence in older populations

4.1 Measurement of urinary incontinence in surveys

Despite recent advances by experts in the field of urology and other continence related specialities in more specifically defining lower urinary tract dysfunction, the overall challenge in epidemiological surveys on urinary incontinence has been the absence of standardized and well-validated measures. The great variety of definitions used in different study populations and settings has made it difficult to draw comparisons across studies (Hampel et al. 1997, Thom 1998). Notably few studies have attempted to specify the different types of incontinence (Diokno et al. 1986, Tseng et al. 2000). Furthermore, due to the relatively new clinical definition of an overactive bladder, few studies have covered the potentially milder symptoms such as urgency and frequency in the syndrome complex.

Most epidemiological surveys on incontinence have been based on self-reported symptoms without clinical or urodynamic confirmation of the diagnosis. This is, however, understandable in that such examinations are difficult to perform in large-scale epidemiological surveys. Nevertheless, in a study by Kirschnerr-Herrmanns and associates (1998) on the accuracy of survey questions on urinary incontinence, questions were best in predicting detrusor overactivity. Quite surprisingly, items on stress incontinence performed poorly. An opposite finding was made in a study by Sandvik and colleagues (1995) among younger women. They concluded that most of the respondents reporting mixed incontinence may in fact have had pure stress

incontinence. On the other hand, a strong relationship was found between urgency and urge incontinence and proven detrusor overactivity in women (Wiskind et al. 1994).

Self-report may be sensitive to an older person`s willingness or ability to report symptoms (Fultz and Herzog 1993). Urinary symptoms, incontinence in particular, are not necessarily easily complained of because they might be embarrassing (Shaw et al. 2000). Older people with cognitive impairment may also be unable to report symptoms themselves (Fultz and Herzog 1993). In these cases proxy-respondents can be used (Abrams 2002). In fact, Shaw and colleagues (2001) noted that the concordance of proxy responses and index responses involving older people is good in the context of urinary and fecal incontinence. However, non-response was higher for questions on incontinence than for functional ability questions. Results in survey-based studies on incontinence may also depend on the mode of collecting data. Higher prevalences of incontinence have been found when using in-person interviews in contrast to mailed questionnaires (Thom 1998).

In spite of the limitations, substantial knowledge can be derived from epidemiological surveys on urinary incontinence in older populations. Epidemiological research on urinary incontinence and other LUTS has been especially lively during the past decade. The major findings relevant to the present study are reviewed in the following.

4.2 Prevalence

Three relatively up-to-date comprehensive papers review the numerous prevalence studies conducted for urinary incontinence in general (Thom 1998, Cheater and Castleden 2000, Hunskaar et al. 2000). All encompass older populations, that is, populations aged 60 years and over. There are notably more studies on the prevalence of incontinence in older women, while fewer deal with older men or simultaneously with both genders using the same definition.

In the following, data are reviewed from the most representative population-based prevalence studies on urinary incontinence including both men and women aged 60 years and over. The prevalence of urinary incontinence is known to be especially high among older people in institutions, varying between 17–31% in acute and between 21–65% in long-term care settings (Cheater and Castleden 2000). This is obviously to be attributed to the presence of other disabilities and comorbidities common among institutionalized people. Studies involving only institutionalized older people are not discussed here. Some studies, however, may include both community-dwelling and institutionalized people. The prevalence studies are listed in Tables 1 and 2.

Regarding gender, women predominate in all age groups; in different studies in populations aged 60 years and over, the prevalence of incontinence in women is 1.1–2.3 times higher than that of men (Table 2). Its prevalence is known to increase with advancing age in both genders and this appears to be true also within older populations. Studies examining different age groups have suggested that the prevalence of incontinence in men approaches that of women among the oldest old. In other words, the gender difference may diminish towards the end of life. For example, Maggi and colleagues (2001) found that the prevalences of urinary incontinence among men and women aged 65-79 years were 9.8% and 19.6%, respectively, while the corresponding figures for men and women aged 80 and over were 22.9% and 29.3%. It is likely that the multiple ageing changes in the lower urinary tract in men and women and the many ageing related disease conditions and functional disabilities mainly account for this phenomenon.

Several studies among women have shown the proportion of stress incontinence to decrease and the proportion of urge and mixed incontinence increase with advancing age (Thom 1998). There are reproductive and hormonal risk factors for urinary incontinence, especially for the stress type, in later life (Thom et al. 1997b, Thom and Brown 1998). These authors concluded that while the menopause constitutes one risk factor for urinary incontinence, there would appear to be little increase in incontinence around the perimenopausal period. Furthermore, any long-term effects of the menopause on incontinence are impossible to separate from the effects of ageing.

Diokno and associates (1986), in a pioneering study on the prevalence of urinary incontinence among community-dwelling people aged 60 years and over, reported the prevalence of stress, urge and mixed incontinence to be 8%, 35% and 29% in men and 27%, 9% and 56% in women. The corresponding figures in a more recent study by Tseng and colleagues (2000) among men and women aged 65 years and older were 3%, 14% and 7% and 28%, 17% and 16%, respectively. Taken together, urge incontinence seems to be the most common type among older men, followed by the mixed type, while the pure stress type seems to be notably less frequent. This is to be expected given that stress incontinence in men mainly develops as a consequence of prostatectomy.

In all, prevalence figures for urinary incontinence vary markedly from one study to another.

Table 2. Definitions and prevalence of any incontinence in men and women in different studies.

Study	Age	Institutionalized included	Definition	Prevalence		W/M Ratio
				Men	Women	
Wetle et al. 1995	65+	No	Having difficulty in holding urine until reaching a toilet	34%	44%	1.3
Vehkalahti and Kivelä 1985	84/85 years	Yes	Any uncontrolled leakage of urine	39%	41%	1.1
Diokno et al. 1986	60+	No	Losing any volume of urine in a minimum of 6 days and within 12 months	29%	56%	1.9
Hellström et al. 1990	85 years	Yes	Occurrence of involuntary urinary leakage objectively confirmed by use of a pad test	18%	35%	1.9
Maggi et al. 2001	65+	No	Having urinary incontinence problems	11%	22%	2.0
Damian et al. 1998	65+	No	Currently experiencing any difficulty in controlling urine, in other words having involuntary escape of urine	15%	16%	1.1
Gavira Iglesias et al. 2000	65+	Yes	Ever having involuntary or unexpected leakages of urine without being able to control them Ever wetting or dampening underwear, clothes or bedclothes against ones will	29%	42%	1.5
Tseng et al. 2000	65+	Yes	Ever experiencing inappropriate leakage of urine	7%	16%	2.3
Stoddart et al. 2001	65+	No	Having leakage of urine in the past month	23%	31 %	1.4

Modified from Thom 1998

4.3 Incidence and remission

Since studies following up urinary symptoms in ageing persons over time are rare, little is known as to the natural course of the condition. The few longitudinal studies available suggest that urinary incontinence is not necessarily a chronic condition (Herzog et al. 1990, Nygaard and Lemke 1996). Remission can evidently sometimes occur either spontaneously or due to medical or surgical treatments. The disorder can sometimes be transient, for example when consequent upon treatable causes such as urinary tract infections. The clinical presentation of LUTS in BPH may also vary over time.

Herzog and colleagues (1990) determined the two-year incidence, remission and change patterns of urinary incontinence in non-institutionalized older adults. The incidence rates were higher for women than for men (22% vs 9%) and the rates measured from the first to the second reinterview were very similar. In contrast, the one-year remission rates were higher among men than women. Changes in severity over time progressed from continence to mild and from mild to moderate incontinence while severe incontinence appeared to be more or less stable. Regarding the type, women tended to develop first stress incontinence either alone or in combinations with urge; those with stress incontinence remained in this stage or developed mixed incontinence. Men, on the other hand, either developed urge incontinence, remained thus or progressed to mixed incontinent. The authors concluded that the differences in the etiology of incontinence between the genders most likely explain the differences in change patterns.

Nygaard and Lemke (1996) examined the prevalence, incidence and remission rates of urinary incontinence, both stress and urge, in rural older women over a 6-year time span. For urge incontinence, the 3-year incidence and remission rates between the third and sixth years were 28.5% and 22.1%, respectively. The corresponding figures for stress incontinence were 28.6% and 25.1%, respectively. The increased incidence of urge incontinence was associated with age, while improvement in activities of daily living (ADL) was associated with increased remission.

4.4 Risk factors

Determination of the potential risk of urinary incontinence can offer valuable information with regard to prevention and treatments of the condition. Furthermore, it can increase understanding of the nature of the problem. This is of particular importance in older populations given the multifactorial etiology of the condition among the aged.

There are several studies available on the relationship between urinary incontinence and factors related to behaviour, various diseases, health conditions and functional ability in older people. It has to be noted, however, that most of these studies are cross-sectional and do not provide reliable information on possible causal relationships. Even though the factors discussed may partly overlap with the pathophysiology of urinary incontinence, the aim here was mainly to review the potential risk factors as derived from population-based studies.

4.4.1 Behavioural risk factors

Studies on possible behavioural risk factors for urinary incontinence, for example smoking, alcohol use and coffee drinking, have yielded somewhat conflicting results. However, smoking has been reported to be associated with an increased risk of LUTS in middle-aged and elderly men (Koskimäki et al. 1998a) and a relationship has emerged between smoking and incontinence in adult women (Bump and McClish 1992, Tampakoudis et al. 1995).

In the search for a potential association, studies have attempted to differentiate between the effects of current and former smoking. Koskimäki and associates (1998a) reported that the likelihood of currently and formerly smoking men to complain from LUTS was almost the same. It was noted, however, that the risk decreased after cessation of smoking, suggesting a reversible process. Bump and McClish (1992) noted a strong statistical relationship between former and current smoking and both stress and urge incontinence in adult women. They suggested that one explanation for the increased risk especially of stress incontinence could be the effect of persisting and violent coughing on the muscles of the pelvic floor. One hypothesis to explain the association of smoking and LUTS would implicate nicotine, which has shown to produce phasic contractions of the detrusor in animal models (Koley et al. 1984, Hisayama et al. 1988). In addition, a further possible explanation for the associations in elderly men could be the development of clinical BPH through the hormonal changes also implicated in the process (Wilson 1980).

Even though alcohol is known to have diuretic effects, very little is known regarding the possible association between alcohol intake and urinary incontinence or other LUTS. In the few studies available, no clear association between alcohol use and urinary incontinence is reported (Wetle et al. 1995, Muscatello et al. 2001). Coffee has been shown to exacerbate urgency in patients with an overactive bladder and an influence of caffeine on the detrusor has been suggested (Creighton and Stanton 1990). A recent case-control study among women showed an association between high caffeine intake and detrusor instability (Arya et al. 2000). Interestingly, an association emerged

between detrusor instability and current but not previous smoking. These authors suggested that smoking could be a confounding factor in the relationship between dietary caffeine and detrusor instability due to the association between current smoking and caffeine intake. In another study no significant relation between continence status and smoking, alcohol or caffeine intake was noted in middle-aged women (Burgio et al. 1991).

4.4.2 Lower urinary tract problems

Urinary tract infections and asymptomatic bacteriuria are both common in older people (Baldassare and Kaye 1991). Hormone-related urogenital atrophy may predispose postmenopausal women to both urinary incontinence and urinary tract infections (Stamm and Raz 1999). In fact, bacterial cystitis has been found to be associated with enhanced detrusor contractility in some women with an unstable bladder (Moore et al. 2000). Apart from such hypothesizing, however, very little solid epidemiological information is available to confirm the possible association between urinary tract infections and incontinence (Parazzini et al. 2000). Brown and colleagues (1999) have, it is true, recorded a 50% increased risk of urge incontinence in postmenopausal women who reported two or more urinary tract infections in the previous year.

Significant bacteriuria is known to be especially common in older men and women living in institutions (Colling et al. 1994). It has to be noted, however, that treatment of asymptomatic bacteriuria did not affect the prevalence of chronic urinary incontinence among elderly nursing home residents (Ouslander et al. 1995a).

The co-existence of voiding and storage symptoms is a common and well-established feature in BPE caused by BPH. BOO in men may be associated with detrusor overactivity (Thomas and Abrams 2000). BOO is rare in women and little is known regarding voiding symptoms in women in general (Stanton et al. 1983, Brieger et al. 1996, Swithinbank et al. 1999). Nevertheless, symptoms similar to those mentioned by men have been reported by women when answering questionnaires designed to evaluate the presence of LUTS in men with BPH (Lepor and Machi 1993, Chai et al. 1993, Chancellor and Rivas 1993, Roberts et al. 1998). Such symptoms may also occur in men without BOO (Ding et al. 1997). It has been suggested that voiding symptoms are neither gender- nor BPE-specific. One explanation for this could be ageing changes e.g. impaired contractility of the detrusor (Madersbacher et al. 1998, Groutz et al. 1999). In all, very few population-based epidemiological data are to hand on concomitant urinary incontinence and other LUTS especially in older women.

4.4.3 Non-urological health conditions

Several chronic diseases and non-urological health conditions, both singly and in combinations, have been reported to be associated with urinary incontinence as well as other lower urinary tract dysfunction in older men and women (DuBeau 1996, Koskimäki et al. 2001). Associations have been found between urinary incontinence and cardiovascular and musculoskeletal diseases, gastrointestinal illnesses, metabolic disorders such as diabetes, neurologic conditions such as cerebrovascular disorders, Parkinson's disease and dementia, respiratory problems, depression and visual and hearing impairments.

Once again, only few studies have specified the type of incontinence involved or made comparisons between the two genders. Diokno and associates (1990) reported that both fecal incontinence and constipation were markedly associated with urinary incontinence in both men and women; women with stress incontinence were least likely to lose control over the bowels. Males with urge incontinence and females with mixed incontinence were most likely to report coughing or sneezing. More recently, Maggi and colleagues (2001) reported chronic diarrhea to be associated with urinary incontinence in men while chronic obstructive pulmonary diseases, parkinsonism and hip fractures were linked in women. Interestingly, urge incontinence was found independently to increase the risk of falls and fractures among community-dwelling older women (Brown et al. 2000).

An association between urinary incontinence and depression has been suggested in several previous studies and various cultural settings (DuBeau 1996, Black et al. 1998, Al-Shammari and Al-Subaie 1999). It is, however, particularly difficult to determine whether depression is a risk factor for or an outcome of urinary incontinence. A fairly common and easily acceptable explanation for the association is the negative emotional and psychosocial impact of urinary incontinence on the individual affected (Dugan et al. 2000, Fultz and Herzog 2001). Another recently introduced suggestion is that the association between urinary incontinence and psychological distress may be mediated by condition-specific functional loss (Bogner et al. 2002).

Previous conclusions on a relationship between urinary incontinence and dementia were drawn from studies involving institutionalized dementia patients with other severe disabilities. These assumptions have recently been questioned; according to a comprehensive review on the subject by Skelly and Flint (1995), urinary incontinence is more prevalent in demented than in nondemented older individuals. The authors emphasized, however, that urinary incontinence is not an inevitable consequence of cognitive impairment. Especially mobile patients with even severe cognitive decline may be continent. Furthermore, incontinent people suffering from cognitive decline or

dementia may have other potentially remediable etiologies, a circumstance which should be taken into account in clinical practice.

4.4.4 Medications

Many pharmacological agents may have effects on lower urinary tract function (Gormley et al. 1993, Resnick 1996). Less is known as to the association of various drugs with urinary incontinence and other LUTS in older populations. Diokno and (1991) found no significant difference between users and non-users of diuretics and continence status in either gender. However, male diuretics users with uninhibited detrusor contractions (UDC) had a significantly higher prevalence of urinary incontinence when compared with non-users with UDC. Finkelstein (2002) reported from an extensive Canadian National Population Health Survey involving people aged 30 years and over that use of diuretics, laxatives and antidepressants was strongly associated with incontinence in both sexes. In addition, the use of tranquilizers and antibiotics was associated with incontinence in women and the use of narcotics was associated with incontinence in men. In another study among frail older persons living in the community, oxidative benzodiazepines especially with a long elimination half-life predicted urinary incontinence in contrast to non-oxidative agents and oxidative agents with a shorter elimination half-life (Landi et al. 2002).

4.4.5 Functional disability

Results on the association between impaired mobility and ADL disability with urinary incontinence in older people are fairly consistent across a number of studies. In one of the early works, urinary incontinence was found to be associated with limitations in mobility in very old age (Vehkalahti and Kivelä 1985). Difficulty in holding urine was associated with problems in ADL and a decreased frequency and ease in getting out of the house among community-resident people aged 65 years and older (Wetle et al. 1995). These findings have lately been confirmed by Maggi and associates (2001), who noted that community-dwelling men and women aged 65 years and over with mobility or ADL disability were some two times more likely to report incontinence than those without such disabilities.

Only Diokno and a group (1990) have examined the association according to the type of incontinence. Mobility problems were defined as needing a wheelchair or walking aids, having health problems restricting possibilities of visiting, or having a diagnosis of arthritis or rheumatism and having fallen during the last year. For both men

and women aged 60 years and over, the proportion of mobility limitations was greater among incontinent than continent respondents. Furthermore, females with urge symptoms reported difficulty with mobility more frequently compared with those with other symptoms.

The relationship between functional disability and urinary incontinence is far from straightforward. While it is reasonable to assume that problems with mobility may lead to trouble in holding urine, it may equally well be possible that the two conditions, functional disability and urinary incontinence, share a common disabling etiology such as for example a cerebrovascular disorder or dementia. However, McGrother and associates (1990) noted that 31% of incontinent subjects were free from both cognitive and functional problems. Moreover, urinary incontinence has been found to be a major health problem among even the most functional community-residing elderly citizens (Teasdale et al. 1988).

4.5 Outcomes

The principal aim of outcome research is to provide data on the impacts and consequences of the condition on the individual, family and society. Outcome research on urinary incontinence in older populations can offer information regarding the quality-of-life impacts, the economic significance and the prognosis of the condition. These data can be used as a basis when designing various interventions in the health and social care system.

4.5.1 *Quality of life*

Epidemiological and clinical studies have indicated that urinary incontinence has a considerable impact on the overall quality of life and psychosocial well-being of older men and women (Naughton and Wyman 1997). Older women with urge and mixed incontinence report more emotional and sleep disturbances compared with a continent control group (Grimby et al. 1993). Women suffering from any kind of incontinence were socially more isolated than the control group. In men aged 50 years and over, storage symptoms such as urgency and urge incontinence, have been reported to be among the most bothersome LUTS (DuBeau et al. 1995, Sagnier et al. 1995, Koskimäki et al. 1998b, Echardt et al. 2001). Among community-resident men and women aged 65 years and over, half of the incontinent subjects reported some degree of psychosocial limitation (Gavira Inglesias et al. 2000). In a study by Brown and colleagues (1998)

among community-dwelling women, the effect of incontinence on quality of life correlated with frequency, nocturia and pad use.

A focus group of older persons with urge incontinence regarded the impact of the complaint on their emotional well-being and interruption of activities as most crucial (DuBeau et al.1998). Homebound older adults with many health problems and functional disabilities perceived urinary incontinence as a very disturbing problem which further restricted their activities (McDowell 1996). Participants, however, were optimistic about the potential benefits of the treatments.

Recent large-scale studies concerning the overactive bladder syndrome in adult populations have indicated that symptoms without urinary leakage, i.e. urgency and frequency are considered bothersome (Milsom et al. 2001) and may negatively affect the health-related quality of life (Lieberman et al. 2001).

4.5.2 Economic consequences

Most of the studies on the economic impact of urinary incontinence have dealt with direct expenses, that is, costs attributable to the evaluation and management of the condition and its consequences (Wagner and Hu 1998, Hu and Wagner 2000). Indirect costs such as time spent by the caregiver in taking care of an incontinent individual are more difficult to estimate. An attempt has been nonetheless made to assess the informal caregiving costs associated with urinary incontinence in a nationally representative sample of older Americans (Langa et al. 2002). More caregiver time was spent in taking care of an elderly individual with incontinence than without the problem. In addition, there remain the intangible costs associated with pain, suffering and impaired quality of life which make it ever more challenging to estimate the total economic burden of the condition (Wagner and Hu 1998, Hu and Wagner 2000).

What is known so far is that most of the direct expenses caused by incontinence are attributable to routine care, i.e. incontinence aids, laundry and nursing labour (Hu 1990, Wagner and Hu 1998, Wilson et al. 2001). Furthermore, additional admissions to nursing homes and longer hospitalization periods most likely account for some of the expenses caused by incontinence (Wagner and Hu 1998, Wilson et al. 2001). Altogether the direct outlay by health and social care services for incontinence in the United States has been estimated to be equivalent to that for other chronic disease conditions common among older people such as osteoporosis and osteoarthritis (Wilson et al. 2001).

4.5.3 Institutionalization

Given the high prevalence of incontinence among institutionalized people, institutionalization has been suggested to be an outcome of urinary incontinence. However, population-based longitudinal data on the subject are scarce. Urinary incontinence and troublesome behaviour may be burdensome to the caregiver (Noelker 1987, Ouslander et al. 1990, Flaherty et al. 1992), which might be one reason why these have been held to predict nursing home admission and institutionalization in dementia (O'Donnell et al. 1992, Hope et al. 1998, Lim et al. 1999). In other highly selected populations such as older patients admitted to hospitals or nursing homes, urinary incontinence has been found to predict subsequent living in an institution (Lewis et al. 1985, Ekelund and Rundgren 1987). Post-stroke incontinence has also been found to increase the likelihood of an older individual becoming institutionalized (Patel et al. 2001a, Patel et al. 2001b, Pettersen et al. 2002).

In a previous multivariate population-based study the association between urinary incontinence and the likelihood of being institutionalized over a 5-year period was explained by dementia (Tilvis et al. 1995). Thom and colleagues (1997a), on the other hand, have reported that medically recognized urinary incontinence increased the risk of hospitalization and the risk of admission to a nursing home independently of age, gender and the presence of other chronic disease conditions such as cerebrovascular disorders and dementia.

4.5.4 Death

One of the hypotheses in outcome research on urinary incontinence in older populations has been the potential association of urinary incontinence with an increased risk of death. According to earlier studies concerning selected populations such as older people living in institutions, the association is well established (Donaldson et al. 1980, Donaldson and Jagger 1983, Ekelund and Rundgren 1987). A relationship has also been found in previous univariate studies involving random populations (Campbell et al. 1985, Koyano et al. 1986).

In more recent multivariate population-based studies the aim has been to examine incontinence as an independent predictor of mortality after controlling for other possible predictors. Results from these studies have been somewhat contradictory. Herzog and colleagues (1994) found no increased risk of mortality attributable to incontinence after adjustment for age, education, health status and self-reported health. On the other hand, a clear association of urinary and fecal incontinence with mortality has recently been

brought out even after controlling for age, health status and psychosocial conditions (Nakanishi et al. 1999). In another study, the predictive association of urinary incontinence with death in a general aged population over a 5-year period was explained by dementia (Tilvis et al. 1995). Thom and associates (1997a) reported that there was a not particularly high but significant association of medically recognized incontinence with mortality which remained after adjusting for co-morbid conditions in men while in woman the crude risk was no longer significant after adjustments. In a recent study by a group under Johnson (2000a) the crude association between urinary incontinence and increased mortality diminished after controlling for age, education, health and functional status. It is likely that rather than urinary incontinence itself, other disabilities associated with it in older people explain the associations between the condition and death, urinary incontinence being thus presumably a marker of general deterioration in these populations.

5 Treatment options for urinary incontinence in older people

Older people constitute a heterogeneous group of individuals, a circumstance which has to be taken into account when designing treatments for urinary incontinence in this patient group. In otherwise healthy individuals the same principles as for adult patients can be applied, however, the group of frail older people may require a more delicate approach in view of possible adverse events and compliance factors (Fonda et al. 1998a, Ouslander 2002).

In general, treatment options for urinary incontinence in older people may consist of pharmacological, behavioural and surgical interventions and their combinations. Anti-muscarinic medications such as oxybutynin or the more novel tolterodine can be used for both men and women with an overactive bladder (Goode and Burgio 1997, Malone-Lee et al. 2001). Tolterodine would appear to be more promising especially among older patients in being more urinary bladder selective and having fewer side-effects (Malone-Lee et al. 2001). However, anticholinergic adverse effects such as dry mouth, confusion and tendency to urinary retention may sometimes occur. Trospium-chloride is a substance which not entering the blood-brain barrier and possibly free of central side-effects but involving nonetheless a risk of other side-effects potentially significant especially among the frail elderly people (Dmochowski and Appell 2000).

According to a meta-analysis by Fantl and associates (1994) there has been some evidence of subjective improvement in stress incontinence among postmenopausal women using estrogen therapy even though no actual objective improvement was shown. Even though estrogen treatment may alleviate urogenital atrophy and reduce the

frequency of lower urinary tract infections in older women, the effectiveness of the treatment on urinary incontinence and the most preferable route of administration remain for the present unknown (Pandit and Ouslander 1997). Older men with BPH and either voiding or storage LUTS seem to benefit from alfa 1 receptor antagonists (Sullivan and Abrams 1999, Scarpa 2001, Wagg and Cohen 2002). In selected cases, surgery can be considered for men with an overactive bladder and BPH on the basis of urodynamically established BOO (Knutson et al. 2001) and for women with stress incontinence (Carr et al. 1997).

Behavioural therapy includes pelvic floor muscle exercises in older women (Burgio et al. 2000) and scheduled or prompted voiding protocols especially in institutionalized older people (O'Donnell 1998, Fonda et al. 1998a). Even patients with cognitive impairment and dementia may benefit from the latter protocols (Engberg et al. 2002). However, the long-term benefits may be jeopardized by the labour intensivity of those programs. Nevertheless, adding either oxybutynin (Ouslander et al. 1995b) or tolterodine (Ouslander et al. 2001) to toileting protocols has further improved continence in a selected group of incontinent nursing home residents. According to a randomized controlled trial by Burgio and colleagues (1998) among incontinent women aged 50 years and over with a predominant urge component and without dementia or other serious disabilities, behavioural treatment (pelvic floor exercises with or without biofeedback) showed safety and effectiveness superior to drug treatment (oxybutynin). Furthermore, combination of these two therapies produced added benefit (Burgio et al. 2000).

Environmental modifications can also be applied especially among frail elderly people (Fonda et al. 1998a). There could also be several potentially remediable conditions not directly related to bladder function among frail older nursing home residents with incontinence (Brandeis et al. 1997). For example, a careful review of the medications, treatment and prevention of fecal impaction, and interventions aiming at improving mobility may be beneficial. Finally, incontinence aids such as diapers and collecting devices can be used as tertiary preventive measures for incontinence in cases where other therapies have failed or proved inadequate (Fonda et al. 1998a). In general, more studies are needed to evaluate the benefits of various treatment options and their combinations among older people and especially in the group of frail elderly people (Fonda et al. 1998b).

In all, a considerable body of data on urinary incontinence in general in older populations is evidently to hand in the current epidemiological literature. However, data on urgency and urge incontinence and related LUTS in older populations of both genders when using the same definitions have so far been relatively scarce. The present study was undertaken to increment this limited knowledge.

AIMS OF THE STUDY

With increasing numbers of elderly people in society, more epidemiological data on urinary problems in older people are needed in the social and health care system. The general aim of this cross-sectional and longitudinal survey was to examine the prevalence, associated factors and prognosis of urgency and urge incontinence in a random older population.

The specific aims were the following:

- 1) To assess the prevalence of urgency, urge incontinence and related LUTS. (I, II)
- 2) To identify the health, social and behavioural factors associated with urgency and urge incontinence. (II, III)
- 3) To describe the current treatments for urinary incontinence as self-reported. (II)
- 4) To describe changes in urgency and urge incontinence over time. (V)
- 5) To assess the long-term prognostic significance of urgency and urge incontinence for institutionalization and mortality. (IV, V)

MATERIAL AND METHODS

1 Study populations and designs

The data for this study were drawn from the Tampere Longitudinal Study on Ageing (TamELSA), a major multidisciplinary longitudinal study initiated as part of the European Longitudinal Study on Ageing (ELSA), previously known as the Eleven Countries Study (Heikkinen et al. 1983, Jylhä et al. 1992, Ferrucci et al. 1995). The project focused on health, functional ability, living conditions and their changes in older populations in a cross-national setting. The TamELSA now consists of three interviews at ten-year intervals. The response rates were high (Table 3). The design of the TamELSA and the basic characteristics of the three waves are summarized in Figure 1 and Table 3.

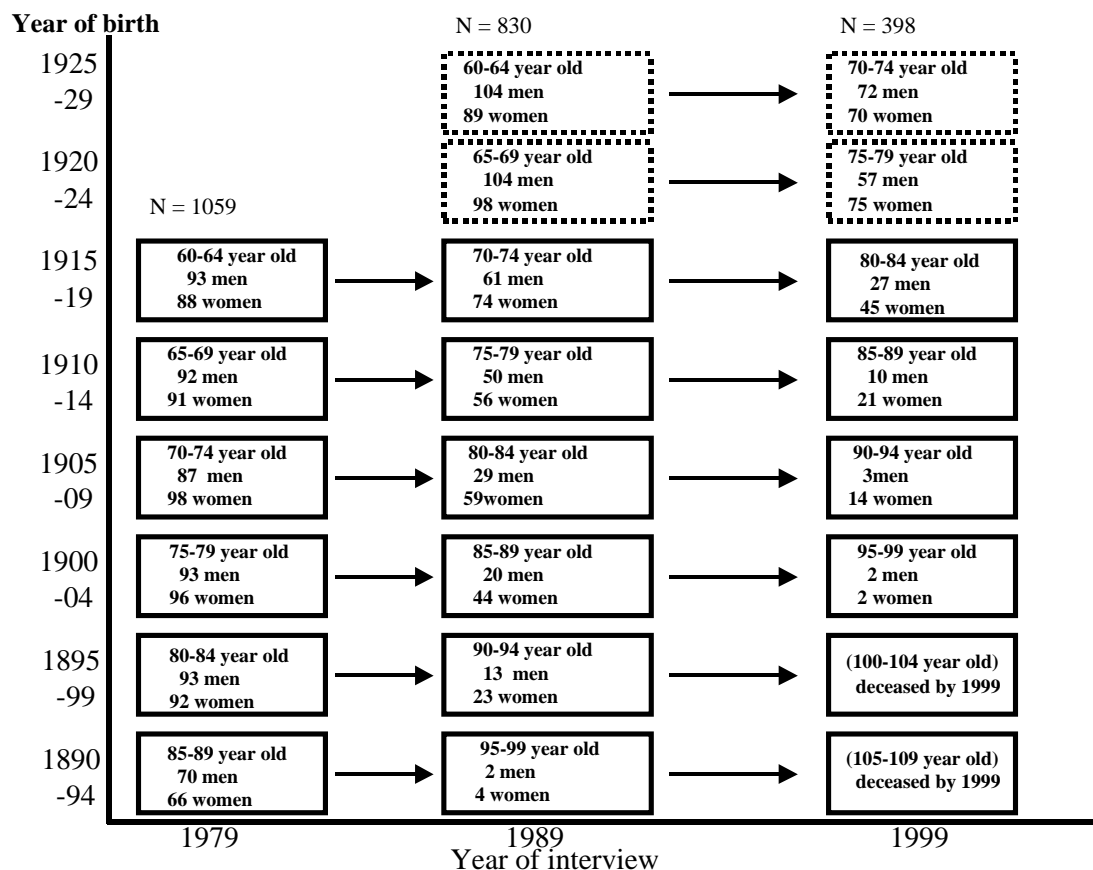


Figure 1. Design and final number of participants in the five-year age-cohorts of the TamELSA. The new cohorts selected in 1989 are indicated with a dashed line.

Table 3. Basic characteristics of the three waves of the TamELSA survey in 1979, 1989 and 1999–2000.

Survey year	1979	1989	1999–2000
Total (N)	1309	1036	429
Total loss (N)	250	206	31
Refusals	144	129	24
No contact	37	52	3
Died before interview	–	23	–
Others	69	2	4
Respondents N (men/women)	1059 (528/231)	830 (383/447)	398 (171/227)
Response rate (%)	81	80	93
Mean age (range)	73 (59–90)	72 (59–96)	77 (70–98)
Living in institutions (N)	56	66	43
Proxies (N)	66	40	15

For the baseline in 1979, subjects listed in the local population register were stratified according to gender and 5-year age group (men aged 60–64, 65–69...85–89 years, and women aged 60–64, 65–69...85–89 years). A random sample was drawn from each of the 12 strata, with oversampling of the two oldest 5-year age groups. Both community-dwelling and institutionalized subjects were included. The sample was drawn from the Population Register in the city of Tampere in the beginning of 1979, but the last update of the Register was from the 1st of January 1978. Thus, 160 people included into the original sample had died before the sampling, and 25 out of them had moved out of Tampere before sampling. The real sample size, thus, was 1309 persons.

The 10-year follow-up study was conducted in 1989 when additionally a new group of 520 persons aged 60–69 years, also stratified by gender and five-year age group, was selected. The third wave was undertaken in 1999–2000 with the survivors from the two earlier waves. The number of losses and the final number of participants in the three waves of the TamELSA are presented in Table 3.

The designs of the five substudies constituting the present work according to the three waves of the TamELSA are shown in Figure 2. Populations from all three waves were used and both cross-sectional and longitudinal designs were applied. For the prevalence studies (I–II), the material from the third wave in 1999–2000 was used, consisting of altogether 398 people aged 70–98 years, 171 men and 227 women. The

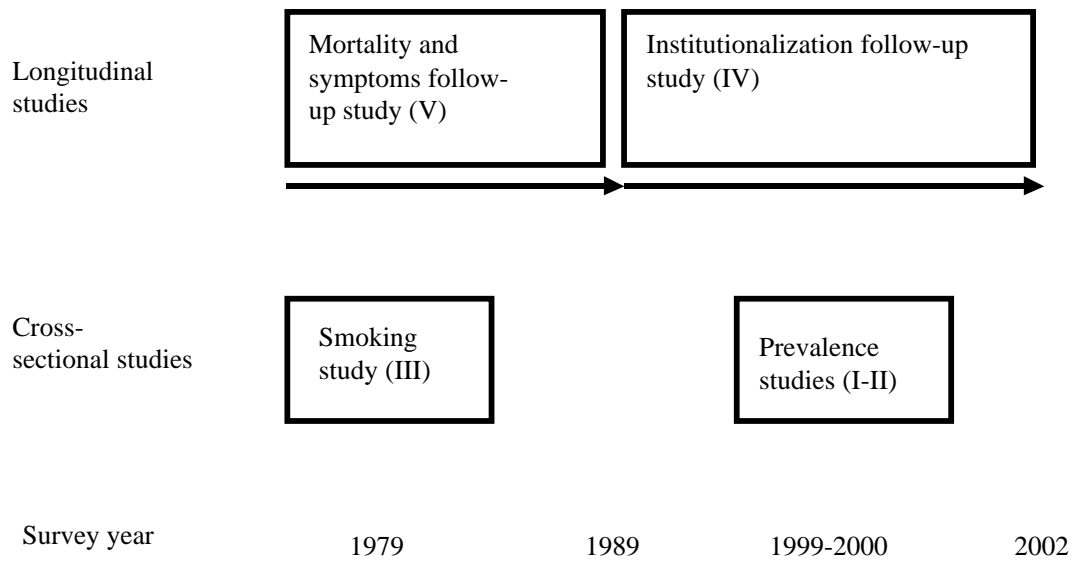


Figure 2. Designs of the five substudies according to the TamELSA.

original baseline material of the TamELSA in 1979 (N=1059; 528 men and 531 women aged 60–89 years) was used in the smoking study (III), investigating the association of smoking and other behavioural indicators with urgency.

The baseline data for the institutionalization follow-up study (IV) were derived from the second wave of the TamELSA in 1989. After exclusion of 53 subjects already living in institutions and 3 subjects without data on urinary symptoms, the baseline material consisted of 775 community-dwelling persons aged 60 years and over, of whom 366 were men and 409 women. The institutionalization follow-up extended beyond the third wave up to the year 2002.

The original baseline material of the 1979 TamELSA was used as baseline in the mortality and symptoms follow-up study (V). After exclusion of 7 subjects without data on urinary symptoms, the baseline material comprised altogether 1052 persons (524 men and 528 women).

2 Methods

2.1 Survey interviews

The survey questionnaire of the TamELSA originally consisted of up to 170 questions on respondents' health status, functional ability, living conditions, life style and use of

services. A similar questionnaire was used in the second wave in 1989. In the third wave a somewhat revised questionnaire was introduced .

Interviewing of all the three waves was undertaken in respondents' homes or institutions. The interviewers in the two first waves were female graduate students of social and health sciences who had received training for the task organized by the research group. The number of interviewers was 11 in the first and 13 in the second wave. In the third wave, the interviews were undertaken by 7 professional female interviewers from the Statistics Finland. These interviewers had extensive experience, but they also had a one-day special training organized by the TamELSA group.

The cognitive ability of the respondents to answer the questions was screened by a brief set of questions at the beginning of the paper. In cases where the interviewee was unable to answer the questions, a proxy interviewee was used. In these cases, questions of subjective opinions and feelings were not asked. Most often a relative was used as a proxy, but in some cases the information was given by the staff at the ward of the hospital or nursing home. In most cases at least when the interview did not happen in an institution, the need of proxy could be confirmed only at the interview situation. The numbers of proxies used in the three waves of the TamELSA are shown in Table 3.

2.2 Weighting process

By reason of the original stratified sampling method of the survey, the crude results in the cross-sectional studies should be generalized to the population of Tampere at the time of the surveys in 5-year age groups. To be able to generalize the figures in studies I–III for the whole male or female populations of the same age at the time of the surveys, weights were used, calculated for each 1-year age group, separately for men and women as

$$k = (N_i/N)/(n_i/n),$$

where N_i is the number of men/women in a specific 1-year age cohort at the time of the surveys in Tampere, N is the number of all men/women aged 70 years and over in 1999–2000 (I–II) or aged 60–89 and over in Tampere in 1979 (III), n_i the number of men/women in specific 1-year age group in the TamELSA and the number of all men/women aged 70 years and over in 1999–2000 or 60 years and over in the 1979 TamELSA. After weighting, the results can be generalized to the whole Tampere population aged 70 years and over in 1999–2000 or 60 years and over in 1979.

2.3 Institutionalization and mortality data

Dates of admissions to long-term institutional care in the institutionalization follow-up study (IV) were derived from the computerized files of the City of Tampere, which cover both public and private units. However, as no computerized admission files were available from the time before 1994, these dates were manually extracted from the archives of all institutions providing long-term care, including nursing homes and health centre hospitals in the city.

Vital status and dates of death during the survey were provided by the National Population Register Centre.

2.4 Measurement of variables

2.4.1 *Urgency, urge incontinence and other LUTS*

For measurement of urgency, the following question was asked in all three waves of the TamELSA: “Do you ever have trouble in getting to the lavatory in time – yes or no?” In the case of a positive response the following question was asked to define urge incontinence in the first and the second phase of the survey: “Do you experience urinary leakage either in the daytime or during the night - never, sometimes, frequently?”.

In the third wave, urinary symptoms were inquired after in greater detail than at earlier stages of the study. At the opening of this section, the following introduction was given: “Urinary symptoms are known to be common among older people. I am now going to ask you some questions on them.” The definition of urge incontinence was brought into sharper focus on the basis of the following question: “Does the urge to urinate ever become so strong that there is urinary leakage before you reach the lavatory – never, sometimes, frequently?”.

For measurement of stress incontinence, the following question was asked: “Do you experience urinary leakage during physical exertion for example coughing or lifting – never, sometimes, frequently ?”.

To evaluate voiding symptoms, respondents were asked the following question in the third wave of the survey: “Has your urinary stream become weaker or is there an intermittent stream?” The answers were originally divided into four alternatives: 1) Neither weakened nor intermittent, 2) Only weakened, 3) Only intermittent, 4) Both weakened and intermittent.

The definitions of urgency, urge incontinence and other LUTS in different studies based on the above-mentioned questions are presented in Table 4. The frequency of urine loss was not taken into account in any of the definitions of urinary incontinence and the variables were therefore used in the analyses as dichotomous: reporting or not reporting incontinence. Regarding the voiding symptoms, only a few respondents (one man and 14 women) reported only intermittent stream, and therefore the answers “Only intermittent and “Both weakened and intermittent” were combined into one category representing a potentially more severe form of voiding symptoms.

2.4.2 Health, social and behavioural indicators

To define comorbidity, respondents were asked to report any chronic disease affecting their daily activities as diagnosed by a physician. The diseases were coded as cardiovascular, nervous system, urogenital, endocrine, gastrointestinal, infectious, respiratory, hematological, musculoskeletal, mental and cancers. Only few respondents reported urogenital diseases and since the urinary symptoms in the present study were the independent variables, urogenital diseases were excluded.

In II, comorbidity was defined as reporting diseases in at least three of the above-mentioned disease categories. In IV, chronic diseases were categorized as cardiovascular, neurological, musculoskeletal and other. In V, chronic diseases were used as a continuous variable and the number of disease categories varied from 0–9 (in addition to urogenital diseases, musculoskeletal diseases were omitted).

ADL disability was measured using a set of 13 questions dealing with physical and instrumental activities of daily living (walking between rooms, dressing and undressing, getting in and out of bed, feeding oneself, walking at least 400 m, using a lavatory, washing oneself and taking a bath, moving outdoors, using stairs, carrying heavy loads, doing one’s own cooking, cutting toenails and doing light housework). The following pre-set alternatives were given: 1) Yes, can do without difficulty; 2) Yes, can do with difficulty but without help; 3) Yes can do, but only with help; and 4) No, cannot do. Categories 2–3 were classified as ADL problems.

In V, ADL was used as a continuous variable, the number of reported ADL problems varying from 0–13. In II and IV, the dichotomous ADL disability variable was defined as having or not having difficulties in at least one of the basic ADL functions: walking between rooms, using the lavatory, washing oneself and taking a bath, dressing and undressing, getting in and out of bed and eating.

Table 4. Definitions of urgency, urge incontinence and other LUTS used in different studies.

Study	Main subject	Survey year	Symptom	Definition
I	Prevalence and mutual associations of urge and voiding symptoms	1999–2000	Urgency	Having trouble in getting to the lavatory in time but no urinary leakage
			Urge incontinence	Having a strong urge to urinate with urinary leakage before reaching the lavatory
			Voiding symptoms	Having weakened and/or intermittent stream
II	Prevalence and associated factors in different types of urinary incontinence	1999–2000	Urge incontinence	Having a strong urge to urinate with urinary leakage before reaching the lavatory
			Stress incontinence	Having urinary leakage during physical exertion e.g. coughing or lifting
			Mixed incontinence	Having both urge and stress incontinence
III	Association of smoking with urgency	1979	Urgency	Having trouble in getting to the lavatory in time regardless of urinary leakage
IV	Institutionalization follow-up	1989	Urge incontinence	Having trouble in getting to the lavatory in time with urinary leakage either in the daytime or during the night
V	Mortality and symptoms follow-up	1979	Urgency	Having trouble in getting to the lavatory in time but no urinary leakage
		1989	Urge incontinence	Having trouble in getting to the lavatory in time with urinary leakage either in the daytime or during the night

To define depressive mood in II, the short version of the Geriatric Depression Scale (GDS 5) (Hoyl et al. 1999) was used with the following questions: 1) “Are you satisfied with your life?”, 2) “Are you often bored?”, 3) “Do you often feel helpless?,” 4) “Do you rather stay at home than go out to do something new?,” and 5) “Do you feel nowadays somehow of no value and insignificant?” Depressive mood was defined at scores of at least two points out of five.

Since the GDS-5 was available only for the third wave, depressive symptoms in IV were defined on the basis of reporting at least one of the following symptoms during the last two weeks prior to the interview: difficulties in getting to sleep, unwillingness to do things or lack of energy, tiredness or feelings of faintness, nervous tension or nervousness or bursts of anger and low spirits or depression.

Respondents were asked how many drugs they had been taking regularly during the previous three months as prescribed by a physician. Polypharmacy in II was defined as taking at least four such medications. The respondents were also asked whether or not they used sleeping medications and this information was used in II as a dichotomous variable.

They were further asked to report the number of urinary tract infections treated with antibiotics during the previous two years. Reporting or not reporting at least one treated urinary tract infection was used in II. Fecal incontinence was defined in II as having any leakage of feces.

For measurement of social participation, respondents were asked how many times during the last 12 months they had visited places or participated in events and trips such as 1) family occasions, 2) theatre, movies, concerts and art exhibitions, 3) occasions organized by societies, 4) library, 5) sports events as participant or spectator, 6) religious events, 7) travelling abroad and 8) travelling inside the country (at least 100 km). In II, low social activity was defined as attending only 2 or less of these events.

In IV, living arrangements were defined as living alone or living with somebody regardless of family relationship. Socioeconomic status was assessed by asking what occupation the respondent had had for the longest time. In V, the occupational categories were defined as non-manual or manual.

In III and V, the smoking variable was categorized as current, former or never smoker. Former smoking was defined as a history of smoking regularly almost every day at least for 1 year but not smoking currently, and current smoking as smoking regularly now. The use of alcohol in III and V was categorized as using or not using spirits, beer or wine regardless of the amount or frequency of consumption. The coffee drinking variable used in III was categorized according to cups of coffee drunk per day: 1–2 cups, 3–4 cups and 5 or more cups per day.

2.5 Statistical analyses

Cross-tabulations were used to chart the prevalence of urgency, urge incontinence and other LUTS by gender and age group and to establish the distributions of the other indicators according to urgency status. Differences in the distributions of categorical variables were compared using chi-squared statistics and the median ages and means by Mann Whitney-test. The limit for statistical significance was set at 0.05.

Logistic regression models with odds ratios (OR) and 95% confidence intervals (CI) were used in the cross-sectional studies to examine the age-adjusted associations between the urgency variable and the indicators in question. In I and III, the urgency variables were the outcomes while in II the dichotomous health and social indicators were the outcome variables.

During the follow-up in IV, time was assessed as person years and the dates of admissions to long-term institutional care were taken as the events. Time was counted up to the date of death for those who died at home and until the end of the follow-up period for those who survived living at home.

Cox proportional hazards models with relative risks (RR) and 95% confidence intervals (CI) were used to examine the age-adjusted and multivariate association of urge incontinence with institutionalization in IV and the association of urgency and urge incontinence with 10-year mortality in V adjusting for the chosen confounders.

In V, differences in developing incontinence during the 10-year follow-up were assessed by calculating the incidence proportional ratio (IPR). The observed numbers were assumed to follow a Poisson distribution.

All analyses were conducted separately for men and women with the exception of the additional combined analyses for both genders in I and III.

RESULTS

1 Prevalence and ten-year changes in urgency and urge incontinence

The true percentual distributions of urgency and urge incontinence in the five-year age groups and genders in all three waves of the TamELSA are shown in Figure 3. There was a marked increase in reporting especially urge incontinence within the same age group when shifting from the first to the second and third wave. This trend was especially notable in women between the first and the second wave and in men between the second and the third.

Owing to the more clearly specified definitions for urinary symptoms in the third wave in 1999–2000, this wave was used to evaluate the prevalence of urgency and urge incontinence. The weighted prevalence of these in men and women aged 70 years and over in the different age groups are presented with 95% confidence intervals in Table 5. The prevalence of urge incontinence among both men and women aged 70 and over was greater than that of urgency alone (24% vs 10 % and 36% vs 9%, respectively). The prevalence of urge incontinence was statistically significantly higher among women than among men ($p=0.038$).

Ten-year changes in urgency and urge incontinence in men and women are presented in Figures 4 and 5. As the main aim here was not to calculate prevalence, crude baseline figures for urgency and urge incontinence were used. During the ten-year follow-up, the proportion of men and women developing urgency was almost the same, while women developed urge incontinence more frequently than men (11% vs 3%). The difference in the likelihood of developing symptoms was statistically significant with an IPR of 3.47 (95 % CI 1.94–6.21). It has to be noted, however, that owing to the high mortality rate during the long follow-up period, true incidence or remission figures could not be estimated.

Correspondingly, the crude baseline prevalence figures for urge incontinence in the second wave (5% for men and 15% for women) were used in IV when examining the prognostic association of urge incontinence with institutionalization.

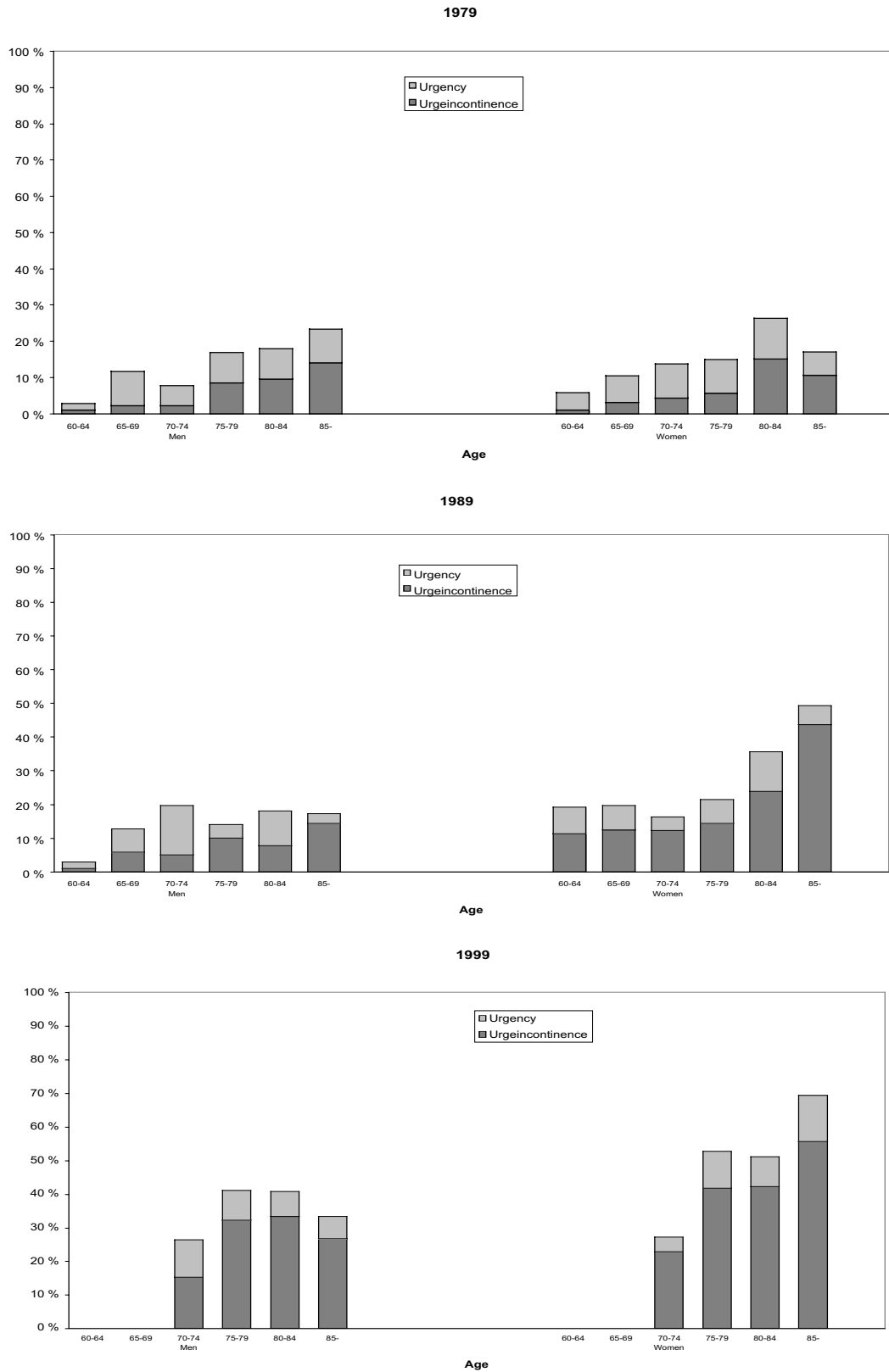


Figure 3. Percentual distribution of urgency and urge incontinence in the five-year age groups and genders in the three waves of the TamELSA.

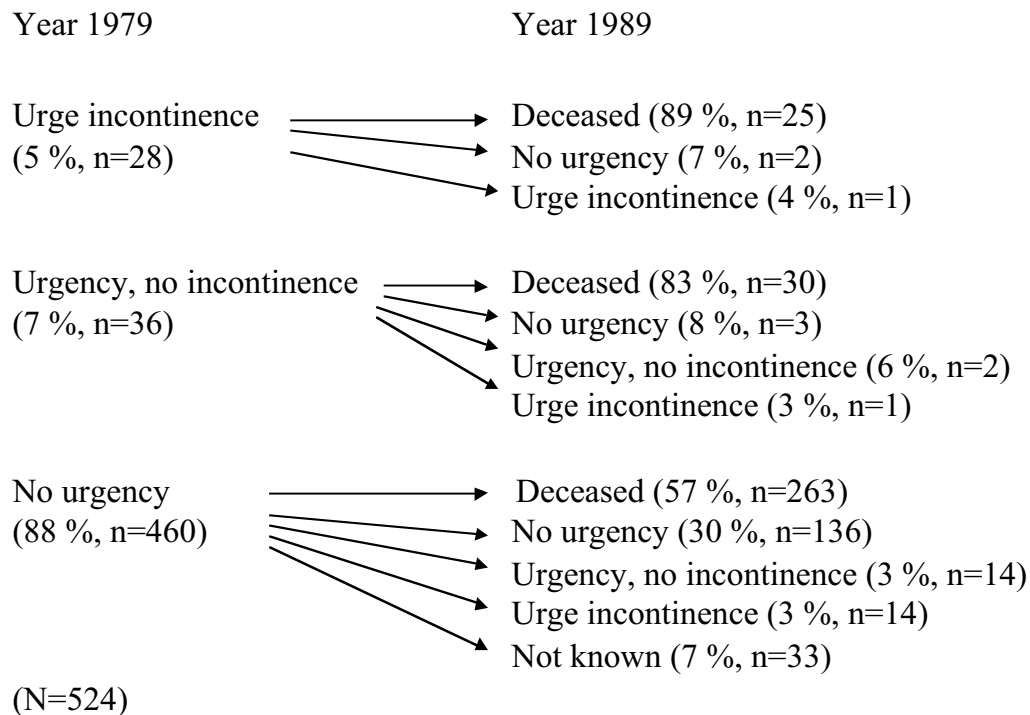


Figure 4. Ten-year follow-up of urgency and urge incontinence in men (V). Reprinted with permission from Aging Clin Exp Res 2002;14:414.

2 Prevalence of related LUTS

The weighted prevalence of voiding symptoms and different types of incontinence in the respective age groups and genders among people aged 70 years and over with 95% confidence intervals are presented with urge symptoms in Table 5.

Voiding symptoms (weakened and /or intermittent stream) were reported by 72% of the men and by 48% of the women ($p < 0.001$). Men with voiding symptoms were significantly older than those without those symptoms ($p = 0.004$). No such a trend was noted in women.

Altogether, 39% of the men and 55% of the women with voiding symptoms reported urgency with or without incontinence, while 14% of the men and 32% of the women with no voiding symptoms reported urge symptoms. The differences were statistically significant in both sexes ($p = 0.005$).

The prevalences of stress, urge and mixed incontinence among men and women aged 70 years and over were 2%, 17% and 6% and 23%, 6% and 30%, respectively. The median ages of both men and women with urge and mixed incontinence combined were statistically significantly higher than those of men and women without incontinence ($p < 0.05$).

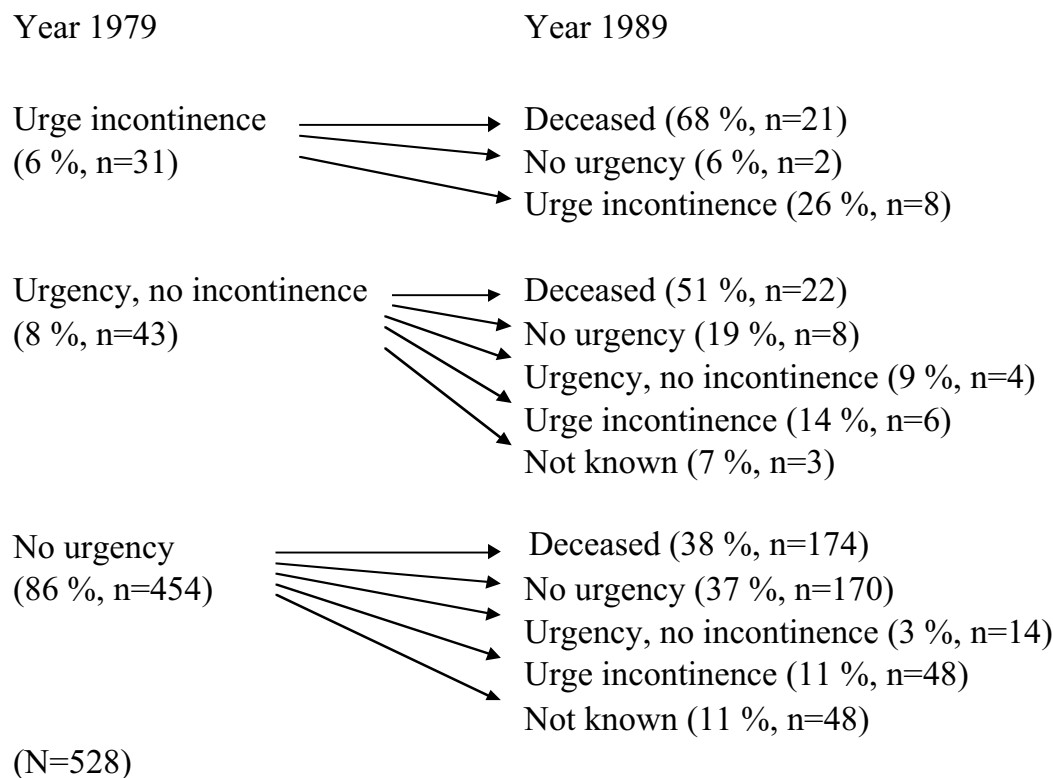


Figure 5. Ten-year follow-up of urgency and urge incontinence in women (V).
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3 Factors associated with urgency and urge incontinence

Among respondents aged 70 years and over, reported voiding symptoms significantly increased the likelihood of urgency with or without incontinence in both men (OR 3.49; 95% CI 1.42–8.57) and women (OR 2.34; 95% CI 1.31–4.17).

In the separate analyses for the two sexes, advancing age increased the risk of urge symptoms in women (OR 1.08; 95% CI 1.03–1.14). In combined analysis including both sexes, female gender was strongly (OR 1.98; 95% CI 1.25–3.16), but age only marginally (OR 1.05; 95% CI 1.01–1.09) associated with an increased likelihood of urge symptoms.

According to cross-tabulations (Table 6), all the indicators of health problems (comorbidity, ADL disability, low social activity, depressive mood, polypharmacy, urinary tract infections and fecal incontinence) except the use of sleeping medication were more frequent in women reporting urge or mixed incontinence compared with continent women or women reporting pure stress incontinence. Similar trends were

Table 5. Summary of prevalence (weighted percentages and 95 % confidence intervals [CI]) of urgency, urge incontinence, voiding symptoms and different types of urinary incontinence in the age groups and genders (I-II). The third wave of the TamELSA in 1999-2000.

	MEN		WOMEN		TOTAL	
	70–79 years	80–98 years	70–79 years	80–98 years	Men	Women
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Urge symptoms						
No urgency	68 (60-76)	60 (42-76)	61 (52-69)	44 (33-56)	66 (59-73)	55 (48-62)
Urgency, no incontinence	11 (5-16)	6 (0-19)	8 (4-14)	10 (4-19)	10 (5-15)	9 (6-14)
Urge incontinence	21 (14-29)	34 (19-52)	31 (23-39)	46 (34-57)	24 (17-30)	36 (30-43)
Voiding symptoms						
No voiding symptoms	33 (24-41)	9 (2-24)	54 (46-63)	48 (35-60)	28 (21-35)	52 (45-59)
Weakened stream	40 (31-49)	38 (22-56)	22 (15-29)	33 (22-45)	39 (32-47)	25 (20-31)
Weakened and intermittent stream	27 (18-34)	53 (35-70)	24 (16-31)	19 (11-31)	33 (25-40)	23 (17-28)
Incontinence						
No incontinence	77 (70-85)	63 (45-79)	45 (36-53)	35 (24-46)	75 (68-82)	41 (34-47)
Stress incontinence	2 (0-6)	3 (0-15)	24 (17-31)	20 (12-31)	2 (0-6)	23 (17-28)
Urge incontinence	17 (10-24)	20 (8-37)	5 (2-10)	8 (3-16)	17 (11-23)	6 (3-10)
Mixed incontinence (urge and stress incontinence combined)	4 (1-9)	14 (5-30)	26 (19-34)	37 (26-49)	6 (2-11)	30 (24-36)

Table 6. Health and social characteristics (weighted %) of men and women with urge, mixed and stress incontinence and age-adjusted associations of urge and mixed incontinence with these characteristics. Odds ratios (OR) and 95% confidence intervals (CI) for urge and mixed combined versus no incontinence. The third wave of the TamELSA in 1999–2000.

Type of incontinence	MEN					WOMEN				
	None (n=124)	Urge (n=32)	Mixed (n=10)	Stress (n=4)	OR (95% CI)	None (n=90)	Urge (n=13)	Mixed (n=70)	Stress (n=48)	OR (95% CI)
Living in an institution yes vs no	0	7	20	33	—*	3	23	30	6	13.55 (3.27-56.05)
Comorbidity At least 3 diseases vs 0-2	48	54	64	100	1.40 (0.66-2.93)	51	69	68	58	1.94 (1.02-3.69)
ADL disability At least 1 vs no difficulties	17	36	40	67	2.59 (1.14-5.89)	21	46	52	16	3.55 (1.72-7.32)
Low social activity Less than 3 events or visits vs at least 3	38	46	60	67	1.29 (0.61-2.75)	40	77	56	28	1.88 (0.98-3.59)
Depressive mood At least 2 vs 0-1 in GDS-5	17	39	25	50	2.69 (1.14-6.34)	16	38	32	27	2.49 (1.10-5.63)
Polypharmacy More than 3 vs 0-3 drugs	33	50	29	67	1.55 (0.68-3.50)	48	60	60	36	1.56 (0.79-3.08)
Sleeping medication yes vs no	30	29	20	33	0.70 (0.30-1.62)	41	23	38	43	0.76 (0.40-1.44)
Urinary tract infections At least 1 vs no treated infections / 2 years	7	7	11	0	1.06 (0.25-4.55)	26	39	40	24	1.69 (0.87-3.30)
Fecal incontinence Any leakage vs no leakage	1	4	0	33	3.50 (0.24-50.37)	2	15	15	2	7.84 (1.53-40.05)

* Odds ratio and confidence interval could not be estimated because there were no men without incontinence living in an institution.

noted in men reporting urge or mixed incontinence compared with continent men. Most of the characteristics appeared to be most frequent among men reporting pure stress incontinence, albeit that the reliability of these figures is jeopardized in the view of the small number of men (N=4) in this group.

In the logistic regression models adjusted for age (Table 6), urge and mixed incontinence combined in women were associated with living in an institution, comorbidity, ADL disability, depressive mood and fecal incontinence, while in men an association was found between urge and mixed incontinence and ADL disability and depressive mood. All the men living in an institution were incontinent of urine. Stress incontinence only (figures not shown in the table) was not associated with any of the health and social indicators in women.

Among respondents aged 60–89 years, smoking increased the risk of urgency in the combined age- and gender-adjusted logistic regression models. The OR of urgency for current smokers was 2.76 (95% CI 1.43–5.32) and that for former smokers 1.63 (95% CI 0.97–2.74) compared with never-smokers. In this model, age (OR 1.08; 95% CI 1.05–1.10) and female gender (OR 1.76; 95% CI 1.10–2.82) increased the risk of suffering from urgency.

In the separate models, current male smokers (OR 2.55; 95% CI 1.13–5.73) and former female smokers (OR 2.62; 95% CI 1.14–6.0) were at increased risk of urgency. The OR for former male smokers was 1.28 (95% CI 0.68–2.41) and that for current female smokers 2.54 (95% CI 0.79–8.22), although the latter group was very small.

Alcohol use and coffee drinking were not significantly associated with urgency in either the combined or the separate models for the two genders. Age was significantly associated with urgency in every model.

4 Treatments for urinary incontinence

Respondents aged 70 years and over reporting any kind of incontinence were asked whether they had been treated for their complaint either with medications (other than antibiotics) or surgically. Respondents were also asked to report the use of incontinence aids such as diapers or collecting devices and the use of urinary catheters.

Of the incontinent men, 14% had been treated medically and 10% surgically; the corresponding figures for women were 11% and 4%. Diapers were more frequently used by women than men (46% vs 9%) and especially by those women with urge or mixed incontinence. Only 2% of the incontinent men had a collecting device, the figure possibly being biased by the small number of men reporting mixed or stress incontinence. Only one woman had a urinary catheter.

5 Urge incontinence as a predictor of institutionalization

During the 13-year follow-up, 13% of men and 26% of women aged 60 years and over at baseline moved into an institution. Of the men 50% and of the women 37% died before being institutionalized.

In the age-adjusted analyses, urge incontinence (RR 2.96; 95% CI 1.33–6.61), other chronic diseases (RR 2.33; 95% CI 1.35–4.02), ADL disability (RR 2.04; 95% CI 1.06–3.89) and depressive symptoms (RR 1.32; 95% CI 1.12–1.55) predicted institutionalization in men. In women, living alone (RR 1.95; 95% CI 1.24–3.06), cardiovascular diseases (RR 1.63; 95% CI 1.09–2.44), other chronic diseases (RR 1.00–2.13) and ADL disability (RR 1.80; 95% CI 1.13–2.89) were significant predictors. The group of other chronic diseases consisted of endocrine, gastrointestinal, infectious, respiratory, hematological and mental disorders and cancers.

In the multivariate analyses, simultaneously adjusted for age and all other health and social indicators, higher age in both men (RR 1.15; 95% CI 1.10–1.19) and women (RR 1.15; 95% CI 1.12–1.19) significantly predicted institutionalization. Urge incontinence remained a strongly significant predictor of institutionalization in men (RR 3.07; 95% CI 1.24–7.59). In addition, depressive symptoms still showed some predictive power (RR 1.22; 95% CI 1.0–1.48). In women, in addition to age, living alone was the only independent predictor in the multivariate analysis (RR 2.02; 95% CI 1.27–3.21). There was no association between urge incontinence and institutionalization in women.

6 Urgency and urge incontinence as predictors of mortality

During the 10-year follow-up the majority of both men and women aged 60–89 years at baseline and complaining of at least urgency (with or without incontinence) died. The mortality rates for men and women with urgency were 86% and 54% and without urgency 57% and 38%.

Adjusted for age (Figure 6), both urgency and urge incontinence significantly predicted death within ten years in men. The RR for urgency was 1.87 (95% CI 1.28–2.74) and that for urge incontinence 3.13 (95% CI 2.05–4.77). Among women, only urge incontinence was a statistically significant predictor of death with an RR 1.63 (95% CI 1.03–2.57) compared with women not suffering from the symptoms. The RR for urgency alone was 1.40 (95% CI 0.90–2.19).

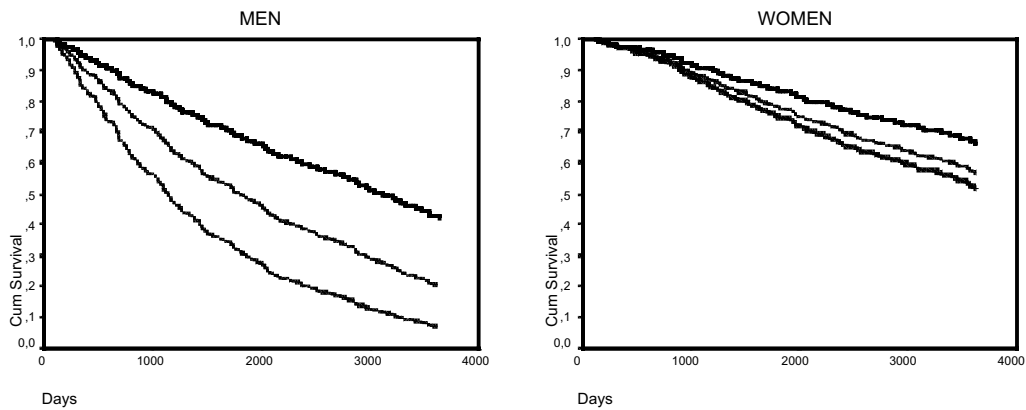


Figure 6. Age-adjusted survival curves for urgency and urge incontinence in men and women (V). Lines from up to down: no urgency, urgency (without incontinence) and urge incontinence. Reprinted with permission from *Aging Clin Exp Res* 2002; 14:415.

After further adjustment for comorbidity and ADL disability, urge incontinence lost its predictive power (RR 1.44; 95% CI 0.88–2.23) in women. The significant predictive power of urgency alone (RR 1.80; 95% CI 1.20–2.71) and urge incontinence (RR 1.97; 95% CI 1.25–3.10) in men persisted even when socioeconomic status, smoking and alcohol use were also adjusted for.

DISCUSSION

In spite of the limitations to be discussed in greater detail in the following, the present study succeeded in addressing the significance of urgency and urge incontinence in the older population. The most important finding was a clear-cut difference in the prognostic significance of especially urge incontinence between the two genders. Urge incontinence independently predicted institutionalization and urge symptoms were independent predictors of mortality in men but not in women. Urge symptoms, urge incontinence in particular, were common and voiding symptoms were frequently reported not only by men but also by women. Furthermore, urge and voiding symptoms were mutually associated in both genders. Many women also reported stress incontinence; however, it was the urge component of urinary incontinence which was associated with the major health and social indicators in both men and women. Of the behavioural indicators, especially current smoking was associated with urgency.

1 Material and methods

The TamELSA provided the opportunity to apply both cross-sectional and longitudinal designs. The specific strengths of the study were representative study populations, the possibility to examine the two genders separately and the availability of multiple relevant health, social and behavioural indicators and possible confounders. Furthermore, sufficiently high response rates were reached in all three waves. In the third wave, the total number of participants was relatively small but on the other hand especially in this wave the response rate was exceptionally high. The use of age- and gender-specific weighting in the cross-sectional studies improved the reliability of the material in respect of generalizing the figures to the basic population of Tampere at the time of the surveys. In the longitudinal studies, both the mortality and institutionalization data can be considered reliable. In all three waves face-to-face interviews were undertaken and whenever needed, proxy respondents were used.

The limitations of the study are such as common to other surveys based on self-report. As in most previous epidemiological surveys on urinary incontinence, there was no clinical or urodynamic confirmation of the diagnosis. In particular, even though the statement “Having trouble in getting to the lavatory in time” refers basically to urgency it does not define urinary urgency in the best possible way. This was due simply to the fact that the original TamELSA questionnaire was not designed in the first place to assess urinary symptoms. Actually, the definition for urgency used in the present study

may have captured respondents with difficulties in getting to the lavatory not only due to urge to urinate but also e.g. due to mobility disability. In any case, as currently underscored by the ICS (Abrams et al. 2002), individual causes cannot be specified with any symptom-based definitions alone.

In the third wave, the definition of urge incontinence was revised the better to comply with the current recommendations introduced by the ICS. In addition, more detailed items regarding other LUTS were added to the questionnaire. At the head of the section on urinary symptoms, an introduction was given which emphasized the significance of urinary symptoms among older people. This “stage-setting” is a recommended procedure designed to encourage self-report of potentially embarrassing symptoms (Fultz and Herzog 1993, Fultz and Herzog 2000). Because the main focus in the study was on urgency and urge incontinence, simple questions for other LUTS were preferred. Moreover, urinary symptoms were defined as occurring “ever” with no attempt to define a specific time frame. Fultz and Herzog (1993) suggested that respondents might find it difficult to try to retrieve information from the memory especially when the time frame is very long. Resnick and associates (1994) found little short-term variability in reporting urinary or fecal incontinence over a two weeks’ period, suggesting reasonably reliable prevalence estimates in surveys.

In the present study, the frequency and severity of symptoms were not taken into account. More detailed questionnaires to assess LUTS in men with BPH have been developed during the last decade (Barry et al. 1992, Meyhoff et al. 1993, El Din et al. 1996, Donovan et al. 2000). These questionnaires are probably more appropriate in clinical settings but may not always be practical in large epidemiological surveys. Moreover, no standardized questionnaires on urinary symptoms applicable for both sexes are so far available.

Some of the definitions for associated factors and possible confounders such as comorbidity and depressive symptoms in the institutionalization follow-up study were also somewhat rough, a fact which may have affected the accuracy of the data. This was basically due to the self-reported nature of the study. However, self-report is commonly used, especially in large-scale epidemiological surveys, as a measure for various disease conditions, bearing in mind its limitations (Nilsson et al. 2002).

Like other longitudinal studies based on baseline data, the present study was also sensitive to changes possibly occurring during the follow-up period. In particular, by reason of the high mortality rate during the 10-year follow-up, it was not possible to calculate true incidence or remission rates but rather only to describe changes in the symptoms among the survivors.

2 Prevalence of urgency, urge incontinence and related LUTS

When presented in the five-year age groups, a clear trend towards increased reports particularly of urge incontinence in the same age groups was noted in the more recent waves compared with the earlier ones. Secular changes in reported symptoms may be one possible explanation for this discrepancy. Attitudes towards urinary symptoms may have altered over time, which could explain the more frequent reports in more recent studies. Furthermore, the differences in the true distributions of urgency and especially urge incontinence between the second and the third waves may be attributed to the somewhat revised methodology in the third wave. Firstly, an encouraging introduction was inserted before the section on urinary symptoms. Secondly, a revised definition of urge incontinence was used. In all, the reliability of the third wave may be better in respect of reporting symptoms. The reliability of the first and second wave is by and large satisfactory, the possible bias being more likely under- than overreporting.

In the populations aged 60 years and 70 years and older the prevalence of urge symptoms was higher among women compared with men. This is in principle in accord with the conception that storage symptoms are more prevalent in women than in men in all age groups. In a recent study by Schatzl and colleagues (2001), however, the discrepancy declined beyond the age of 60 years and almost disappeared among the oldest old (over the age of 70 years). In the present study, the prevalence of urge symptoms increased with advancing age in both men and women aged 60 years and older but statistically significantly only in women aged 70 years and older. The prevalence of urge incontinence, the most severe consequence of an overactive bladder, was higher than urgency alone in both men and women (24% vs 10% and 36% vs 9%). This diverges from the situation in younger populations, where symptoms without urinary leakage have been reported to be more frequent (Milsom et al. 2001). The finding is most probably attributable to the multiple predisposing and aggravating factors related to an overactive bladder among the aged.

Quite as expected (Kakizaki et al. 2002), the prevalence of voiding symptoms was higher in men than in women (72% vs 48%). Nevertheless, this high prevalence of voiding symptoms in women has not previously been reported in population-based studies. A prevalence of 13–19% has been reported among younger women (Brieger et al. 1996, Swithinbank et al. 1999). In the study by Diokno and group (1986) involving community residents aged 60 year and older, the prevalence of difficult bladder emptying was 22% in men and 11% in women. In the present study, the prevalence of voiding symptoms increased with age in men, while no such a trend was noted in women. This is consistent with findings in a recent large-scale population-based study by Schatzl and associates (2001). However, in lack of standardized definitions, any

comparisons between studies should be made with caution. Moreover, voiding symptoms, especially in women, have correlated poorly with urodynamic findings (Stanton et al. 1983, Groutz et al. 1999), even though poor stream was the most common symptom associated with urodynamically confirmed voiding difficulty (Stanton et al. 1983). In one recent study, slow stream was the only LUTS found to be associated with elevated residual volumes in hospitalized older women (Tan et al. 2001).

That voiding symptoms were also common among women implies that LUTS in older men and women may in part share common etiologies. One explanation could be ageing-related pathophysiological changes in the detrusor i.e. the underactive detrusor (Madersbacher et al. 1998). In addition, many drugs used by older people, such as psychotropic medications or calcium antagonists used for cardiovascular diseases, may adversely affect the contractility of the detrusor and contribute to voiding symptoms in both genders (Resnick 1996, Gormley 1993). On the other hand, the observation that voiding symptoms increased the likelihood of reporting urge symptoms especially strongly in men is most likely attributable to the higher incidence of BOO in men having a prostate problem.

One possible explanation for the association between voiding symptoms and symptoms of urgency and urge incontinence in both genders could be detrusor hyperactivity with impaired contractility (DHIC), a concept introduced for the first time by Resnick and Yalla in 1987. This rather paradoxical combination of the two conditions has been estimated to account for about a third of cases of incontinence among the institutionalized elderly. A recent study on the subject concerning a less frail elderly population suggested that when the two conditions occur together, this is presumably due to the coincidence of two common but causally unrelated conditions (Griffiths et al. 2002). In the light of these data the concept of DHIC remains thus somewhat obscure.

The overall prevalence rates for incontinence in men and women (59% vs 25%) in the present study were somewhat higher than those previously reported in community-based samples. This is most likely due to the fact that here, also institutionalized people were included. The relatively small population sample did not allow reliable subanalyses between institutionalized and community-dwelling subjects. However, all the men living in an institution during the third wave in 1999–2000 were incontinent of urine, and reporting urge or mixed incontinence was strongly associated with living in an institution in women.

Even though there are few comparable studies, the differences in the proportions of incontinence between the genders and types were in accord with previous findings (Diokno et al. 1986, Thom 1998). The most common type of incontinence in men was

the urge type, while the mixed type predominated in women. Also stress incontinence was notably common in women.

3 Factors associated with urgency and urge incontinence and self-reported treatments for urinary incontinence

The fact that urge and mixed incontinence were associated with the major health and social indicators in men and women while stress incontinence alone in woman was not, further emphasises the significance and multifactorial nature of the urge component in geriatric urinary incontinence. The findings also underline the importance in clinical practice of differentiating between various types of urinary incontinence in respect of the impacts and outcomes.

The finding that urge and mixed incontinence were associated with comorbidity only in women and that the association with ADL disability was somewhat more marked in women is in accord with a recent study by Maggi and colleagues (2001). Urge incontinence in older men might probably be more often organ-specific, mainly due to BPE, while in women it may more frequently be functional. Furthermore, the observation in the present and previous studies (Herzog et al. 1989, Johnson et al. 2000b) of greater use of diapers by women than men, and especially among those with urge and mixed incontinence, may reflect the severity of the condition in women. On the other hand, women could of course be simply more familiar with the use of protective aids than men.

The association of urge and mixed incontinence with depressive mood is consistent with previous findings (Dugan et al. 2001, Fultz et al. 2001). The most reasonable explanation for this is the negative emotional and psychosocial impact of this bothersome condition. The findings here are also in accord with a recent study by Zorn and associates (1999), who noted a strong association between depression and urge incontinence. The authors introduced a somewhat provocative hypothesis suggesting that urge incontinence and depression may share a common neurochemical origin probably related to reduced serotonergic functioning, which may open new therapeutic possibilities (Steers et al. 2001).

Of the behavioural indicators examined, only smoking showed a significant association with urgency. In fact, for the first time study was made of the potential association between smoking and urinary symptoms simultaneously in older men and women of the same age group using the same definition. A recent study on risk factors for urinary incontinence in men and women under the age of 65 years revealed no

association between smoking habits and urinary incontinence in either sex (Schmidbauer et al. 2001).

As already mentioned, the definition of urgency used in the present study may also have captured respondents with difficulty in getting to the toilet in time due to mobility disability. Smoking is a well-recognized risk factor for such disabling vascular conditions common in older people, e.g. cerebrovascular disorders, arteriosclerosis of the lower extremities and even coronary heart disease. This might at least in part explain the association of smoking with urgency. That especially current smoking was associated with urgency could be explained by the hypothesis of the direct influence of nicotine on the detrusor which has been shown in animal models (Koley et al. 1984, Hisayama et al. 1988). Another explanation for the association especially in older in contrast to younger subjects could be the effect on detrusor function of ischaemia caused by smoking (Azadzi et al. 1999, Saito et al. 1999). It is essential to note, however, that because the study was cross-sectional, no direct conclusions regarding causalities can be drawn from these findings.

Both medical and surgical treatments for incontinence were somewhat more frequently reported by men than women. Since true incontinence surgery is uncommon for men, most of the surgical procedures were very probably performed for BPE. It has to be noted that the medical and surgical treatments reported in the study concern only subjects with present urinary symptoms and they do not thus give reliable estimates of the total frequency of these treatments. Collecting devices were surprisingly few among men, but the rare use of indwelling catheters was in keeping with the recommended guidelines advocating avoidance of these devices (Goolsarran and Katz 2002).

4 Prognosis of urgency and urge incontinence

The major finding in the present study was that urge symptoms constituted significant prognostic indicators especially in older men. Urge incontinence was an independent predictor of institutionalization and urge symptoms independently predicted mortality in men but not in women. This clear difference in the prognostic significance of urinary incontinence between the two genders has not previously been reported even though there has been some evidence implying that such a difference might exist. Thom and associates (1997a) found that medically recognized urinary incontinence predicted nursing home admission and hospitalization more markedly in men than in women. Also a not very high but significant association between urinary incontinence and mortality was noted. The association remained after adjusting for comorbid conditions,

including dementia and cerebrovascular disorders in men, while in women the significant crude risk was no longer significant after adjustments.

In a somewhat controversial study by Herzog and colleagues (1994), urinary incontinence was found to enhance survival in men. The authors themselves questioned the methodology of the study suggesting that the finding might be a result of an anomaly in the study due to overadjustments of some irrelevant controls. Furthermore, instead of counting days alive, they compared alive versus deceased at follow-up. In a recent study, methodologically more sound and comparable with the present one by a group under Johnson (2000a), separate Cox regression models for men and women demonstrated an association between urinary incontinence and increased mortality which was stronger for men than for women. The association diminished after controlling for age, education, health and functional status.

The most reasonable hypothesis to explain the gender difference observed in the prognostic significance of urinary incontinence is that urge incontinence might be a marker of more advanced disability in men, while in women the symptom may occur earlier and without functional disability. Urge incontinence is a combination of overactive bladder and incompetent urethral sphincter. Thus, in women, the generally weaker sphincter may allow urine to leak earlier and even without other functional impairment. In men, on the other hand, the stronger sphincter mechanism may prevent early leakage, which is more likely to appear later with generalized disability. It has to be noted that the mode of measurement of disability in the present study was somewhat crude and did not separate severe from milder disabilities. However, no obvious gender differences have been reported in the present or previous studies in respect of the association between urinary incontinence and disability. Furthermore, the fact that the prognostic association of urge symptoms with both institutionalization and mortality in men remained even after adjustment for ADL disability suggests that there could be other explanations for the gender difference observed here.

Regarding the increased risk of mortality, different causal patterns could at least in part account for the gender difference. The male lower urinary tract is structurally more complex compared with the female and more prone to more severe disturbances. For example BPE can lead to BOO and increased morbidity in terms of a tendency to urinary retention and hydronephrosis or proneness to upper level urinary tract infections (Baldassare and Kaye 1991). Symptoms similar to BPE can be caused by cancer of the prostate, a potentially life-threatening condition, which is, however, much less common than BPE. Even though age-related changes in the urogenital system, e.g. mucosal atrophy and weakness of the muscles of the pelvic floor, predispose older women to urge symptoms, other LUTS and urinary tract infections, these conditions are in principle benign.

Dementing diseases are known to be among the most disabling disorders among older people, with an increased risk of mortality and admission to long-term facility (Agüero-Torress et al. 2001). In fact, in a study by Tilvis and colleagues (1995) the association of urinary incontinence with an increased risk of institutionalization and death was mainly explained by dementia. No differentiation was made between the two genders. Interestingly, the prevalence of incontinence among male dementia patients is known to be equal or greater compared with that of corresponding female patients (Skelly and Flint 1995). This is at odds with the predominance of women reporting incontinence in community-based samples. In two studies by Griffiths (1998) and Griffiths and coworkers (1994) on the cerebral etiology of urge incontinence in older people, the condition was found to be more common among cognitively impaired men than women. The authors suggested that there could be a difference between the genders in the cerebral organization of micturition control. One limitation in the present study was that it was not possible to investigate more specifically the possible effect of cognitive impairment and dementia on the prognostic significance of urinary incontinence in the two genders. This was simply because the original design of the survey in 1979 did not include the cognitive domain and this was not subsequently added. The effects of cognitive impairment and dementia as well as functional disability on the gender difference in the prognostic significance of urinary incontinence call for more careful examination in the future.

One explanation for the gender difference in the association between urge incontinence and institutionalization could be a difference in the psychosocial impact of the condition. As observed in the present and other studies, more incontinent women compared to incontinent men use diapers (Herzog et al. 1989, Johnson et al. 2000b). It may thus be more difficult for an older man compared to an older woman to achieve social continence. Moreover, incontinent men required significantly more daily time and effort from the caregiver compared with that required for incontinent women (Langa et al. 2002). The writers suggested sociocultural differences and differences in the type of incontinence between the two genders as possible explanations.

Findings in the present study regarding the predictors of institutionalization cannot necessarily be generalized to other populations. Social and health care policies differ from one society to another. Especially the decision to institutionalize an older individual depends on the availability of long-term care facilities on one hand and of community-based services on the other. There could, moreover, be differences between urban and rural communities (Coward et al. 1995). There could be also cultural differences in dealing with various disabilities such as urinary incontinence at family and societal level.

During the ten-year follow-up, most of the subjects who survived and had reported urgency or incontinence at baseline maintained the condition or developed a more severe form. Furthermore, women not complaining of symptoms at baseline were statistically significantly more likely to develop urge symptoms. This is in accord with previous findings (Herzog et al. 1990). However, considering the high mortality rate during 10 years and the association of urinary problems with mortality it is probable that a number of deceased respondents might have developed urgency or urge incontinence or even recovered from the symptoms before dying. It is thus worth noting that the difference between men and women developing urge incontinence could in fact be a consequence of the higher mortality in men than in women among those who developed the symptom during the follow-up period.

CONCLUSIONS

1. The prevalence of urge incontinence is higher than that of urgency alone. Women are at greater risk of urge symptoms and advancing age increases the risk especially in women. Voiding symptoms are notably common and associated with urge symptoms in both genders. Urge incontinence is the most common type in men while in women the mixed and stress types predominate. The complexity of urinary symptoms should be considered when planning treatments for older people.
2. Urge and mixed incontinence are associated with major health and social indicators and smoking is associated with urgency; especially current smokers are at risk. Regardless of the cross-sectional nature of the study, a multidisciplinary approach is recommended in the evaluation and management of urinary symptoms in older people.
3. There is a gender difference in the current management of urinary incontinence with continence aids. More incontinent women than incontinent men use diapers and male collecting devices are also rare. Older men and their caregivers may need guidance in coping with the problem of established urinary incontinence if curable treatments have failed.
4. Over time, most individuals with urge symptoms tend to maintain the urgency status or develop a more severe form. Women seem to be at greater risk of developing urge incontinence than men. By reason of the high mortality rate especially in older men, true incidence or remission rates could not be estimated.
5. Urge symptoms are significant long-term predictors of institutionalization and mortality in men but not in women. Urinary incontinence may be a marker of advanced disability in men, but different causal pathways and psychosocial factors may also contribute to the gender difference.

SUMMARY IN FINNISH – SUOMENKIELINEN YHTEENVETO

Virtsankarkailu on iäkkäiden monisyinen terveysongelma, jolla on vaikutuksia ikään-tyvien elämänlaatuun ja sosiaali- ja terveydenhuollon kustannuksiin. Väestön voimakkaasti vanhetessa sosiaali- ja terveydenhuoltojärjestelmässä tarvitaan lisää epidemiologista tutkimustietoa iäkkäiden virtsankarkailusta ja muista virtsaamisvaivoista. Iäkkäiden virtsanpidätysongelmien tärkein ilmentymä on yliaktiivinen rakko-oireyhtymä, jonka pääoireet ovat virtsapakko ja/tai siihen liittyvä pakkoinkontinenssi. Tämän poikkileikkaus- ja pitkittäisasetelman käsittävän kyselytutkimuksen tarkoituksena oli tutkia pakko-oireen ja siihen liittyvän virtsankarkailun esiintyvyyttä, oireisiin vaikuttavia tekijöitä ja pitkäaikaisennustetta iäkkäissä satunnaisväestössä. Aineistona käytettiin Tampereen eläkeikäisten seurantatutkimuksen (TamELSA) kolmea vaihetta 20 vuoden aikana. Osallistumisprosentit olivat korkeat: 81 %, 80 % ja 93 %. Poikkileikkausaineistoissa käytettiin iän ja sukupuolen mukaista painotusta, jotta esiintyvyyksiluvut voitiin yleistää samanikäiseen tamperelaisväestöön tutkimusajankohtina. Koska virtsaamisvaivojen luonne ja niihin liittyvät tekijät voivat olla erilaisia miehillä ja naisilla, useimmat analyysit tehtiin kummallekin sukupuolelle erikseen.

TamELSAN kolmannessa vaiheessa v. 1999–2000 (N=398) pakkovirtsankarkailu oli tavallisempi kuin pakko-oire ilman virtsankarkailua yli 70-vuotiailla miehillä (24 % ja 10 %) ja naisilla (36 % ja 9 %). Naissukupuoli ja korkea ikä erityisesti naisilla lisäsivät pakko-oireiden riskiä. Virtsarakon tyhjennysoireet olivat huomattavan tavallisia: niitä esiintyi 72 %:lla miehistä ja 48 %:lla naisista ($p<0.001$). Tyhjennysoireet lisäsivät merkitsevästi pakko-oireiden riskiä niin miehillä kuin naisillakin. Pakkovirtsankarkailu oli miesten yleisin virtsankarkailutyyppi; naisilla ponnistus- ja sekamuotoinen karkailu olivat tavallisimpia.

Ikävakioidussa logistisessa regressiomallissa naisten yhdistetty pakko- ja sekamuotoinen virtsankarkailu olivat yhteydessä laitoksessa asumiseen, monisairastavuuteen, heikentyneeseen ADL-toimintakykyyn, masentuneisuuteen ja ulosteinkontinenssiin. Vastaavasti miesten pakko- ja sekamuotoinen karkailu olivat yhteydessä heikentyneeseen ADL-toimintakykyyn ja masentuneisuuteen. Kaikki laitoksessa asuvat miehet olivat pidätyskyvyttömiä virtsaamisen suhteen. 46 % pidätyskyvyttömistä naisista, mutta vain 9 % vastaavista miehistä käytti vaippoja. Erityisesti pakko- ja sekamuotoisesta karkailusta kärsivät naiset käyttivät vaippoja. Virtsakatetreja ja miehille tarkoitettuja keräyspusseja ei sen sijaan juuri käytetty.

TamELSAN perustutkimusjoukossa v. 1979 (N=1059) nykyinen tupakointi oli yhteydessä pakko-oireeseen 60–89 vuotiailla henkilöillä molemmat sukupuolet käsit-

tävässä ikävakioidussa logistisessa regressiomallissa (OR [odds ratio] 2.76; 95 % CI [confidence interval, luottamusväli] 1.43–5.32)]. Erillisissä malleissa miesten nykyinen ja naisten aikaisempi tupakointi lisäsivät merkitsevästi virtsapakon riskiä. Nykyisin tupakoivien naisten lukumäärä oli tosin pieni. Tutkimuksen poikkileikkausluonteen takia ei suoraa syy-seuraussuhdetta voitu osoittaa. Alkoholin käyttö ja kahvin juonti eivät olleet yhteydessä pakko-oireeseen.

Kun TamELSAN toisessa vaiheessa v. 1989 kotona asuneita henkilöitä (N=775) seurattiin 13 vuoden ajan, pakkovirtsankarkailu ennusti itsenäisesti laitoshoitoon joutumista miehillä (RR [relative risk] 3.07; 95 % CI 1.24–7.59), mutta ei naisilla. Kyseisessä Coxin monimuuttujamallissa oli vakioitu ikä, yksinasuminen, neurologiset, sydän- ja verisuoni-, tuki- ja liikuntaelin- ja muut pitkäaikaissairaudet, heikentynyt ADL-toimintakyky ja masennusoireet. Muita merkitseviä laitoshoidon ennustajia olivat yksinasuminen naisilla ja masennusoireet miehillä.

TamELSAN alkuperäistä perusjoukkoa seurattiin 10 vuoden ajan tarkoituksena tutkia pakko-oireen ja siihen liittyvän virtsankarkailun ennustevaikutusta kuolleisuuteen. Samalla seurattiin oireiden muutosta elossa olevilla. Miehillä sekä pakko-oire (RR 1.80; 95 % CI 1.20–2.71) että siihen liittyvä virtsankarkailu (RR 1.97; 95 % CI 1.25–2.10) ennustivat itsenäisesti kuolleisuutta, kun ikä, pitkäaikaissairaudet, heikentynyt ADL-toimintakyky, tupakointi, alkoholinkäyttö ja sosioekonominen asema oli vakioitu. Naisilla virtsankarkailun ikävakioitu ennustevaikutus kuolleisuuteen hävisi, kun edellä mainitut muut tekijät oli otettu huomioon. Suurella osalla elossa olevista pakko-oire ja virtsankarkailu olivat pysyneet ennallaan tai oli kehittynyt vaikeampi oire. Naisille pakko-oireeseen liittyvä virtsankarkailu oli kehittynyt useammin kuin miehille (IPR [incidence proportional ratio] 3.47; 95 % CI 1.94–6.21). Todellisia ilmaantuvuus- ja paranemislukuja ei voitu arvioida johtuen erityisesti iäkkäiden miesten suuresta kuolleisuudesta pitkän seuranta-ajan kuluessa.

Yhteenvedona voidaan todeta, että pakko-oire ja siihen liittyvä virtsankarkailu ovat merkittäviä ja monimuotoisia virtsaamisvaivoja iäkkäillä. Niihin näyttää liittyvän huono pitkäaikaisennuste miehillä, mutta ei naisilla. Miehillä virtsankarkailu saattaa olla merkki jo pidemmälle edenneestä yleisestä toimintakykyyn heikkenemisestä, mutta myös erilaisilla syytekijöillä ja psykososiaalisilla seikoilla voi olla vaikutusta nyt todettuun sukupuolieroon virtsankarkailun ennustevaikutuksessa. Yksilöllinen ja kokonaisvaltainen lähestymistapa on joka tapauksessa paikallaan tutkittaessa ja hoidettaessa virtsaamisvaivoja iäkkäillä henkilöillä. Näin voidaan parantaa iäkkään väestön elämänlaatua ja urologista terveyttä.

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