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REVIEW

The prevalence of urinary incontinence

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ABSTRACT

The reported prevalence of urinary incontinence (UI) among women varies widely in different studies due to the use of different definitions, the heterogenicity of different study populations, and population sampling procedures. Population studies from numerous countries have reported that the prevalence of UI ranged from approximately 5% to 70%, with most studies reporting a prevalence of any UI in the range of 25–45%. Prevalence figures increase with increasing age, and in women aged ≥70 years more than 40% of the female population is affected. Prevalence rates are even higher in the elderly-elderly and amongst nursing home patients. There are only a few studies describing progression as well as remission of UI in the general population as well as in selected groups of the population. The mean annual incidence of UI has been reported to range from 1% to 9%, while estimates of remission are more varying, from 4% to 30%. The prevalence of UI is strongly related to the age of the woman and thus, due to the increase in mean life expectancy, the overall prevalence of UI in women is expected to increase in the future.

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Introduction

Urinary incontinence (UI) is a highly prevalent condition with a profound influence on well-being and quality of life as well as being of immense economic importance for the health service[1–4]. Millions of women throughout the world are afflicted[2,3] and there has been a growing interest in these symptoms as a consequence of the increased awareness of the human and social implications for the individual sufferer. Population-based studies have reported that UI is more common in women than men and that approximately 10% of all adult women suffer from UI[2,3]. Prevalence figures increase with increasing age, and in women aged ≥70 years more than 40% of the female population is affected. Prevalence rates are even higher in the elderly-elderly and amongst nursing home patients.

Inappropriate leakage of urine is perceived by many women but is not always reported to the doctor. However, an increasing awareness of the problem has in recent years attracted more patients to seek advice. In elderly women, UI may lead to possible rejection on the part of a relative and may be an important factor in the decision of whether or not to institutionalize an elderly person. UI not only causes personal suffering for the individual afflicted but is also of considerable economic importance for the health service[4]. The annual cost of UI in Sweden, for example, has been reported to account for approximately 2% of the total health-care budget[1].

Prevalence studies

Prevalence is defined as the probability of experiencing a symptom or having a condition or a disease within a defined population and at a defined time point. The concept is important for establishing the distribution of the condition in the population and for projecting the need for health and medical services. The reported prevalence of UI among women varies widely in different studies due to the use of different definitions, the heterogenicity of different study populations, and population sampling procedures. In addition, different definitions of UI have been applied. Studies of disease frequency should rely on a specific definition of the condition under investigation. The absence of a unifying definition for the condition reviewed is a fundamental problem which has not been resolved.

UI has been defined in the joint report from the International Urogynecological Association/International Continence Society as any involuntary leakage of urine[5]. However, some authors have chosen to restrict prevalence figures according to the frequency of involuntary urinary leakage – for example, based only on daily, weekly, monthly, or annual urinary leakage. Thus, for the reasons given, it is difficult to compare the results of different population studies. However, when reviewing the literature, there is considerable evidence to support the theory that the prevalence of UI in women increases with age, but there are divergent opinions regarding the pattern of this increase[3].

The prevalence of urinary incontinence

In a review[3] of population studies from numerous countries, the prevalence of UI ranged from ~5% to 70%, with most studies reporting a prevalence of any UI in the range of 25–45%. This enormous variation between studies is seen

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Table 1. Population-based prevalence rates for female urinary incontinence (UI) in studies sampling more than one country.

Study	Method	Age (years)	Country	Sample	UI	Prevalence (%)
Hunskaar et al., 2004[6]	Postal	18+	France	3881	All UI	44
					SUI	13.6
					UUI	11.9
					MUI	15.0
			Germany	3824	All UI	41
					SUI	16.4
					UUI	6.6
					MUI	15.6
			Spain	6444	All UI	23
					SUI	9.0
					UUI	4.8
					MUI	6.0
			UK	2931	All UI	42
					SUI	17.2
					UUI	6.7
					MUI	14.3
Irwin et al., 2006[7]	Direct or telephone interview	18+	Sweden	19,165	All UI	29.5
			Italy		All UI	9.3
			Canada		All UI	13.0
			Germany		All UI	11.4
			UK		All UI	14.9
Coyne et al., 2009[8]	Web based	40+	USA	10,584	All UI	67.0
					SUI	23.1
					UUI	6.7
					MUI	21.1
			UK	3983	All UI	69.0
					SUI	28.6
					UUI	7.1
					MUI	19.6
			Sweden	1293	All UI	67.1
					SUI	26.9
					UUI	7.9
					MUI	16.2

UUI, urge urinary incontinence; MUI, mixed urinary incontinence; SUI, stress urinary incontinence.

both within and between countries. Few studies report age-standardized rates, which largely precludes a meaningful comparison between countries. If there is a variation in true prevalence rates between countries, it may have been obscured by cultural differences in the perception of UI, a varying willingness to report UI, as well as methodological differences such as the use of different case definitions.

Few studies have used the same survey tools and methods to report the prevalence of female UI in the general population in more than one country (Table 1). Three studies have assessed the relative prevalence in western nations[6–8]. Across all countries surveyed, all three studies reported stress UI to be the most common subtype, followed by mixed UI and then urge UI. Hunskaar et al.[6] surveyed 29,500 women in France, Germany, the UK, and Spain. By demonstration of similar age trends across all countries, they suggested both lower overall prevalence of incontinence in Spain and a relative excess of urge UI in France. The Epidemiology of Incontinence (EPIC)[7] and the Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS)[8] studies used similar questionnaire items explicitly based on standard definitions. However, there was inconsistency between the studies. The EpiLUTS study found similar prevalence of each UI subtype in the USA, the UK, and Sweden, while the EPIC study reported a more than three-fold variation in prevalence between countries, with Sweden having a prevalence of 29.5% and Italy only 9.3%. The disparity in results could be explained by differences in sampling methods, or different response rates (58%, 33%, and 59%, respectively).

Figure 1 illustrates the results from two independent studies of UI in women from the same country. In both studies, prevalence was restricted to women who had urinary leakage at least once per week. Although the study performed by Samuelsson et al.[9] was undertaken in a rural area and that by Simeonova et al.[10] was carried out in an inner city, there are strong similarities between the results of the two studies, with a linear increase in the prevalence of UI which continues over the perimenopausal years.

The prevalence of UI in women has been compared with the prevalence in men of the same age in two large Swedish studies[11,12]. As can be seen from the results illustrated in Figure 2, there is a higher prevalence of UI in women than in men in all of the age groups studied. In general, the prevalence of UI is approximately three times more common in women than in men.

In several studies, attempts have been made to determine the proportion of women suffering from the different types of urinary leakage (i.e. stress UI, urge UI, and mixed UI). In the literature[3], stress urinary leakage tends to dominate among younger women while the numbers of women with urge incontinence and mixed incontinence increase with age.

UI is not static, however, but dynamic and many factors may contribute to the incidence, progression, or remission. There are only a few studies describing progression as well as remission, in the short term, of UI in the general population as well as in selected groups of the population. The mean annual incidence of UI seems to range from 1% to 9%,

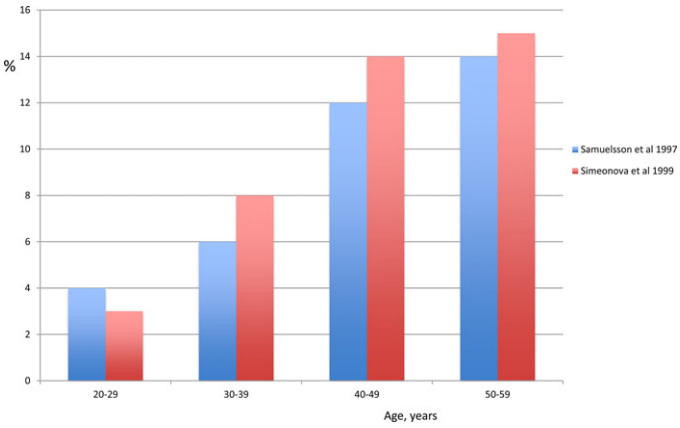

Figure 1. Comparison of the prevalence of urinary incontinence in two population-based studies of Swedish women. The study by Samuelsson et al.[9] was performed in a rural area and the study by Simeonova et al.[10] was performed in an inner city.

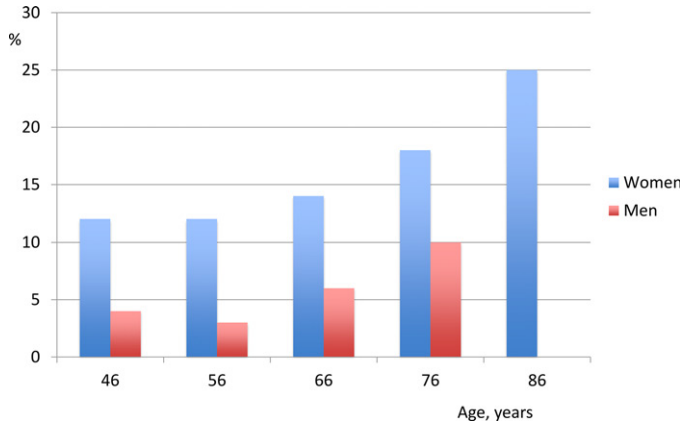

Figure 2. Comparison of the prevalence of urinary incontinence in women and men of the same age resident in the same urban population. Data from two population-based studies which included 7459 women[11] and 7763 men[12].

while estimates of remission are more varying, from 4% to 30%[13–15].

Wennberg et al.[13] studied the prevalence of UI in the same women (aged ≥20 years) over time in order to assess possible progression or regression. A self-administered postal questionnaire with questions regarding UI, overactive bladder, and other lower urinary tract symptoms was sent to a random sample of the total population of women in 1991. The same women who responded to the questionnaire in 1991 and who were still alive and available in the population register 16 years later were reassessed using a similar self-administered postal questionnaire. The overall prevalence of UI increased from 15% to 28% ($p < 0.001$) from 1991 to 2007 and the incidence rate of UI was 21%, while the corresponding remission rate was 34%.

Factors influencing the prevalence of urinary incontinence

Risk factors described in the literature are shown in Table 2. For the majority of these risk factors, there are at present no controlled trials demonstrating that intervention reduces the incidence, prevalence, or degree of severity of UI.

Several studies suggest that the risk of UI 'runs in the family'[3,16–19]. Family history studies have found a two-fold to three-fold greater prevalence of stress UI among first-degree relatives of women with stress UI compared to first-degree relatives of continent women. In the Norwegian Nord-Trøndelag health survey (EPINCONT), daughters of mothers with UI had an increased risk of stress UI, mixed UI, and urge UI[16]. In general, the risk was somewhat higher for sisters of a woman with UI than for her daughters.

Studies from the Swedish twin register indicated that heritability contributes to the liability of developing UI. The authors presented evidence that genetic and non-shared environmental factors equally contributed 40% of the variation in liability[18,19]. Although the study methodology and the magnitude of the risk estimates vary, studies on familial transmission of incontinence are in agreement[3,16–19]: having a first-degree female family member with stress UI increases the risk for an individual becoming afflicted by the same disorder.

The prevalence of UI in nulliparous women of childbearing age has been reported to be 10–15%[20–22]. Al-Mukhtar Othman et al.[23] studied the prevalence of UI in a large cohort of non-pregnant, nulliparous women aged 25–64 years. The overall prevalence of UI was 16.7%. UI increased more than five-fold from 9.7% in the youngest women with a body mass index (BMI) < 25 kg/m^2 to 48.4% among the oldest women with a BMI ≥35 kg/m^2. The prevalence of bothersome UI almost tripled from 2.8% to 7.9% and the proportion with bothersome UI among incontinent women increased to 32.3% in the age group 55–64 years. Mixed UI increased from 22.9% to 40.9% among the oldest nullipara women (0-para) with incontinence, whereas stress UI alone decreased inversely from 43.6% to 33.0%. In the total cohort, surgical treatment for UI occurred in 3 per 1000 cases.

Many studies[3] have assessed the influence of pregnancy, and in particular vaginal delivery, on the risk of developing UI. UI preceding pregnancy in nulliparous women has been shown to be a strong indicator for increased prevalence of UI 4–12 years postpartum[24,25]. Pregnancy in itself, independent of labor and delivery practices, seems to be a risk factor for postpartum UI[26,27], especially if the incontinence started during the first trimester[28]. During pregnancy, the prevalence of UI increases with gestational age[29] so that more than half of all women report UI during the third trimester[30–32]. Stress UI and mixed UI increased most during pregnancy compared to before pregnancy whereas urge UI did not change during the same period[33]. During the first 3 months, the postpartum UI prevalence was 30% and most women had stress UI[34]. In uncomplicated courses of pregnancy and labor, UI usually declines rapidly during the first 3 months following childbirth, indicating that most symptoms are part of a normal pregnancy and delivery[26]. Several studies have also demonstrated that postpartum UI is a risk factor for UI after longer (7 months–6 years) terms of follow-up[27,35–37].

The first delivery is considered to increase the prevalence of UI the most, and recent studies have demonstrated a further increase for each delivery[11,38–41]. Several cross-sectional

Table 2. Risk factors for urinary incontinence.

Risk factor
Age
Parity
Hereditary factors
Pregnancy
Hysterectomy
Delivery mode
Concurrent prolapse
Anal sphincter rupture
Irritable bowel syndrome
Postmenopausal
Ethnicity
Multiple sclerosis
Dementia
Parkinson's illness
Obesity
Physical activity
Neurological illnesses
Diabetes mellitus
Urinary tract infections

Table 3. Estimated number of individuals with urinary incontinence by year and sex.

	Male			*Female*		
Urinary incontinence	*2008*	*2013*	*2018*	*2008*	*2013*	*2018*
Any	98	109	120	250	275	301
Urge	22	25	27	27	30	33
Mixed	11	12	14	43	47	52
Stress	10	12	13	127	140	153
Other	55	61	66	53	58	64

Based on data from Irwin et al.[2].

and several longitudinal studies show a protective effect of Cesarean section for UI[42–45]. BMI is considered to be an established risk factor for UI[40], whereas the association between UI and age is complicated by confounders[46].

Gyhagen et al.[44,45] studied the prevalence of UI 20 years after a single delivery. The risk of developing UI was found to be 71% higher after vaginal delivery than after Cesarean section and the prevalence of UI >10 years almost tripled after vaginal delivery compared to Cesarean section. There was no difference in the prevalence of UI or UI >10 years between women who delivered by acute Cesarean section or elective Cesarean section, indicating that it is during the later stages of delivery, when the fetus passes through the pelvic floor, when the risk of UI increases. Maternal weight was also an important risk factor and, in the multivariate regression analyses, there was an 8% increased risk of UI per BMI unit increase and the rate of UI was apparent for both modes of delivery. Current BMI was the most important BMI determinant for UI and this finding is important, as BMI is modifiable. For women who delivered vaginally, rates of incontinence increased with increasing infant birth weight but this was not observed after Cesarean section. The prevalence of UI increased with maternal age and there was an annual increase in UI prevalence of 3% per year.

Global prevalence

Irwin et al.[2] have published data estimating the current and future worldwide prevalence of lower urinary tract symptoms. Age-specific and gender-specific prevalence rates from the EPIC study[7] were applied to the worldwide population over 20 years old (4.2 billion), with males and females stratified into 5-year age groups (20–24 years to 80+ years). Projected population estimates for all worldwide regions were based on the US Census Bureau International Database. Estimates were presented for 2008, 2013, and 2018 and are summarized in Tables 3 and 4.

Table 4. Global estimates of individuals with urinary incontinence grouped by year and region.

	Urinary incontinence		
Region	*2008*	*2013*	*2018*
World	346	383	420
Africa	33	38	43
North America	32	34	37
South America	20	22	24
Asia	206	231	256
Europe	54	56	57

Based on data from Irwin et al.[2].

Based on the results of the EPIC study[7], the global prevalence of UI was estimated to be 8.7% worldwide. To put this into perspective, with over 421 million people affected, the total prevalence of UI is larger than the total population of the USA (329 million). If UI was a country, it would be the third largest country in the world, surpassed only by India and China.

The global prevalence of urge UI has been assessed in a systematic review[47]. This systematic review identified 54 articles (50 studies); 22 were large-scale, population-based surveys. The prevalence estimates for urge UI ranged from 1.8% to 30.5% in European populations, from 1.7% to 36.4% in US populations, and from 1.5% to 15.2% in Asian populations. Prevalence estimates were highly dependent on age and gender.

Mean life expectancy in the world is increasing, and in some countries 25% of all persons are at present ≥65 years of age. The prevalence of UI is expected to increase in the future and thus there will be a corresponding increase in the number of women requiring treatment for UI. Another important factor to consider, apart from the numerical increase in the number of elderly women, is the fact that many women of today suffer in silence, accepting UI as a normal part of the aging process. Women who are at present 30 and 40 years of age have other demands on their physical condition and will undoubtedly not accept what their older counterparts accepted later in life. Thus, the demands on the health-care services regarding the management of UI are expected to increase in the future, due in part to the aging population.

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