Original Article

ISSN 2465-8243(Print) / ISSN: 2465-8510(Online)
https://doi.org/10.14777/uti.2023.18.3.101
Urogenit Tract Infect 2023;18(3):101-106

Trends in Age-Specific Prevalence of Lower Urinary Tract Dysfunction: A Nationwide Population-Based Cohort Study

Young Hwan Kim[1], Se Hwa Hong[2], Tae Wook Kang[1], Hyun Chul Chung[1], Tae Hyoung Kim[3], Sae Chul Kim[4], Sang Baek Koh[5,6], Jae Hung Jung[1,2,6]

Departments of [1]Urology and [2]Medical Informatics and Biostatistics, Yonsei University Wonju College of Medicine, Wonju, [3]Department of Urology, Chung-Ang University College of Medicine, Seoul, [4]Department of Urology, Myongji Hospital, Seoul, Departments of [5]Preventive Medicine and [6]Precision Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea

Purpose: To elucidate the longitudinal changes in the prevalence of lower urinary tract dysfunction (LUTD) according to age over the past 10 years.

Materials and Methods: The changes in the proportion of prevalence for LUTD, including benign prostatic hyperplasia (BPH) and urinary incontinence (UI) among South Koreans from 2009 to 2018, were analyzed using the National Health Information Database established by the Korean National Health Insurance Service. All conditions were defined according to the corresponding Korean Standard Classification of Diseases-8 for diagnosis and surgical procedures and Health Insurance Review & Assessment Service codes for drugs.

Results: The 60-69, 70-79, and over 80 age groups accounted for more than 60% of the LUTD cases from 2009 to 2018, while significant increases in the crude prevalence of LUTD were observed over a 10-year period in all age groups (p for trend <0.05). In age groups over 60 years, LUTD was more prevalent in men than women, but there was no statistically significant difference in proportion (p>0.05). The changes in the prevalence and prevalence proportion exhibited similar trends in BPH, UI, and LUTD.

Conclusions: LUTD was more prevalent in the elderly aged over 60 years old than in younger adults. Therefore, this study suggests the development of nationwide healthcare policies to manage LUTD in the elderly population of South Korea, which is expected to become the world's most aged population.

Keywords: Epidemiology; Lower urinary tract symptoms; Prostatic hyperplasia; Urinary incontinence

Received: 13 September, 2023
Revised: 25 September, 2023
Accepted: 27 September, 2023

Correspondence to: Jae Hung Jung
https://orcid.org/0000-0002-4990-7098
Department of Urology, Yonsei University Wonju College of Medicine, 20 Ilsan-ro, Wonju 26426, Korea
Tel: +82-33-741-0652, Fax: +82-33-741-1930
E-mail: geneuro95@yonsei.ac.kr

INTRODUCTION

The elderly population is growing rapidly in developed countries, and South Korea is expected to become the world's most aged population [1]. Lower urinary tract dysfunction (LUTD), one of the most common conditions in the elderly population, is expected to have risen significantly in South Korea [2]. LUTD may adversely affect public health and quality of life as it progresses and can cause serious consequences, such as acute urinary retention, urinary tract infection, and upper urinary tract deterioration [2,3].

Based on lower urinary tract symptoms (LUTS) assessments, the global prevalence of LUTD among adults aged over 18 years old is typically estimated to be more than

50% [3]. In South Korea, the overall LUTD prevalence increases with age, ranging from 65.3% to 72.8% in participants over 40 years of age [2].

Previous surveys have reported a marked increase in the prevalence of LUTS with age [2-4]. The European and Korean UrEpik studies indicated that the prevalence of man LUTS increased by 10% per decade from 40 to 79 years [5]. Other population-based studies have shown similar trends in Europe and the United States [6].

On the other hand, few comprehensive studies have been performed on the overall prevalence of LUTD in the general population because of the extensive range of individual disorders that can affect the urinary tract function. Furthermore, the longitudinal data studies on the age-specific prevalence of LUTD in Korea are still lacking. In addition, the age-specific prevalence of LUTD between men and women varied because of the anatomical difference (e.g., prostate) and gender-specific risk factors (e.g., alcohol consumption) [5,6].

Therefore, this study examined the longitudinal changes in the proportion of prevalence of LUTD, including benign prostatic hyperplasia (BPH) and urinary incontinence (UI), according to age over the past 10 years (2009-2018) using the Korean National Health information data, a nationwide database containing all claims data. These conditions are the most common disease categories within LUTD in men and women. Furthermore, this study examined the gender differences in the prevalence of LUTD in South Korea.

MATERIALS AND METHODS

This study was approved by the Institutional Review Board of the Yonsei University Wonju College of Medicine (CR320350).

1. Data Source

This study analyzed nationwide Korean population-based data from January 2009 to December 2018. Korean National Health Information Data is a nationwide repository of population-based cohort data collected by the Korean National Health Insurance Service, which offers comprehensive medical services to all citizens of South Korea. The National Health Information data, which covers 97% of all citizens in the Republic of Korea, encompasses various healthcare data. This includes demographic characteristics, diagnoses, comorbidities, prescriptions, diagnostic or surgical procedures, and the medical costs associated with claims.

2. The Definition of LUTD

The definition of LUTD, including BPH and UI, was defined according to the corresponding Korean Standard Classification of Diseases (KCD)-8 for diagnosis and surgical procedures and Health Insurance Review & Assessment Service codes for drugs. Supplementary Table 1 lists the specific codes used to define every diagnosis, surgical procedure, and drug in this study.

Individuals with LUTD who met the following criteria between 2009 and 2018 were identified: (1) outpatient service claims with LUTD codes; (2) those who received medications including alpha-blocker, cholinergic, anticholinergic, or beta 3 agonists, or underwent surgical procedures for BPH and UI within one year before the index date. The date of the initial diagnosis code was designated as the index entry date. Furthermore, individuals with BPH were also identified based on the criteria involving diagnosis, procedure, and drug codes: (1) outpatient service claims with BPH codes; (2) those who received alpha-blockers or underwent surgical procedures for BPH within one year before the index date. For individuals with UI, the criteria consisted of (1) outpatient service claims with UI codes and (2) those who received anticholinergic or beta 3 agonists or underwent surgical procedures for UI within one year before the index date.

3. Statistical Analysis

Based on the calculated annual crude prevalence (per 100,000 people) of LUTD, including BPH and UI, which was calculated using the direct method of standardization with the Korean Census 2010 as a reference [7], the proportion of LUTD in each age group (<40, 40-49, 50-59, 60-69, 70-79, ≥80) was expressed by year and gender. The χ^2 test was used to analyze the difference in proportion of the prevalence of LUTD by gender. The χ^2 test for trend was used to evaluate the changes in the crude prevalence for 10 years by the age group. The statistical analysis used SAS V.9.4 (SAS Institute Inc.). Statistical significance was defined as $p<0.05$.

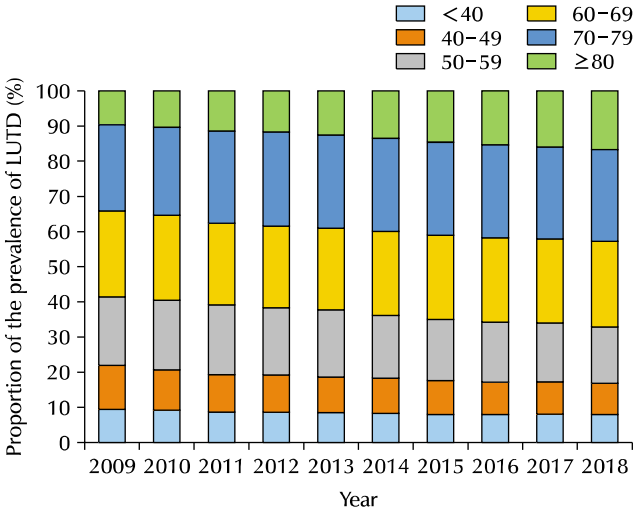

Fig. 1. Proportion of the prevalence of lower urinary tract dysfunction (LUTD) according to the age group during a 10-year period.

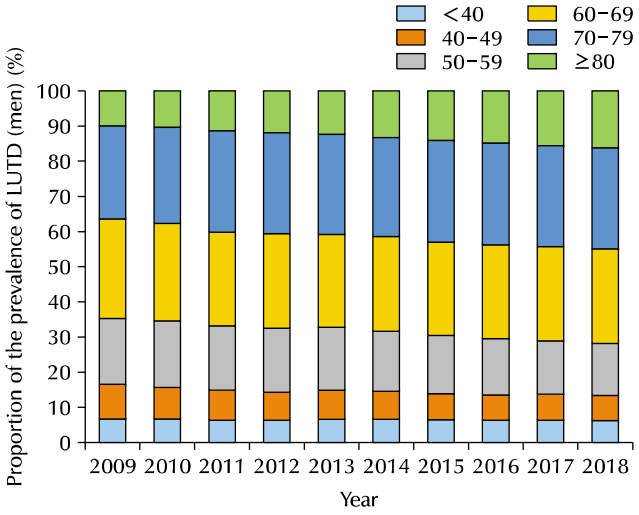

Fig. 2. Proportion of the prevalence of lower urinary tract dysfunction (LUTD): men.

RESULTS

1. LUTD

The age groups of 60-69, 70-79, and over 80 accounted for more than 60% of the LUTD cases from 2009 to 2018. The age groups of 60-69 and 70-79 exhibited a higher proportion (over 20% each) among age groups from 2009 to 2018 (Fig. 1). The prevalence proportions of the 60-69 age group appeared to remain relatively stable, around 23-24%. In contrast, the prevalence of the 70-79 and ≥80 age groups increased from 24.3% and 9.8% in 2009 to 25.9% and 16.8% in 2018, respectively (p for trend <0.05). While statistically significant decreases in the proportion of prevalence were observed over 10 years in three age groups, namely, <40, 40-49, and 50-59 (p for trend <0.05), there were statistically significant increases in the crude prevalence of LUTD in all six age groups over the 10 years (p for trend <0.05).

For both men and women, the proportion of prevalence of LUTD according to age showed a similar pattern to that of the overall LUTD prevalence. LUTD was more prevalent in men than in women in age groups over 50 years old, and the prevalence of LUTD in women was relatively similar across all age groups rather than in men. On the other hand, there was no statistically significant difference in proportion (p>0.05) between men and women for the 10-year period (Fig. 2, 3). The prevalence proportions of 60-69, 70-79, and ≥80 age groups in men were from 28.1%, 26.7%, and 9.8% in 2009 to 26.7%, 28.9%, and 16.0% in 2018, respectively.

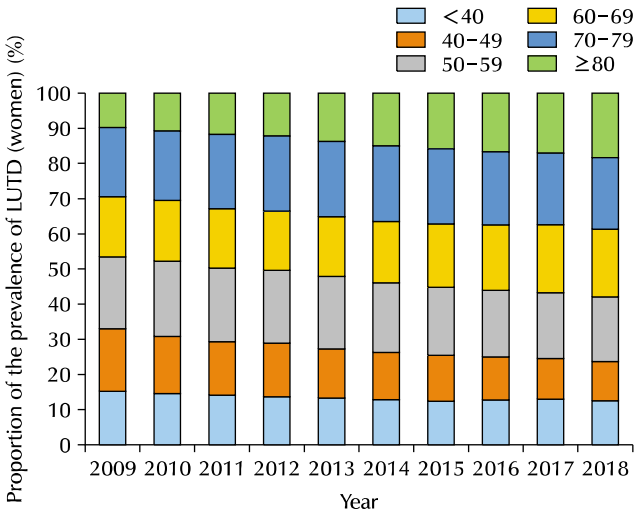

Fig. 3. Proportion of the prevalence of lower urinary tract dysfunction (LUTD): women.

In women, prevalence proportions of 60-69, 70-79, and ≥80 age groups in men increased from 17.1%, 19.6%, and 9.7% in 2009 to 19.3%, 20.5%, and 18.1% in 2018, respectively. In all age groups, statistically significant increases in crude prevalence were found in men and women over a 10-year period (p for trend <0.05).

2. BPH

The proportion of the prevalence of BPH by age also showed a similar pattern to that of the overall prevalence of LUTD. Men aged 60 years and above constituted approximately 70% of all patients yearly. The age group of 70-79 years accounts for a higher proportion of the

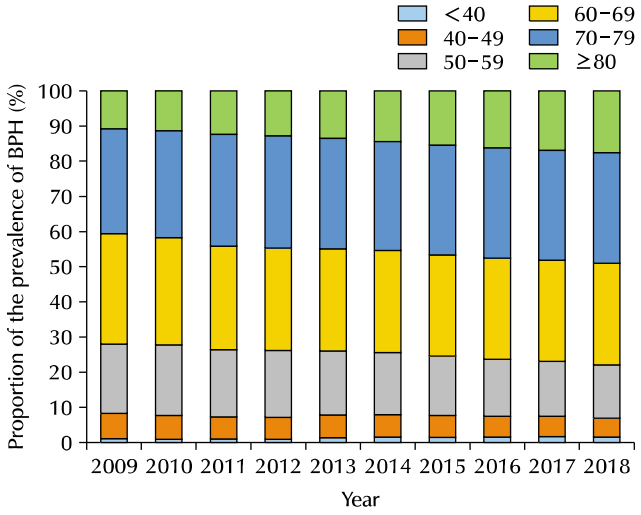

Fig. 4. Proportion of the prevalence of benign prostatic hyperplasia (BPH) by the age group during a 10-year period.

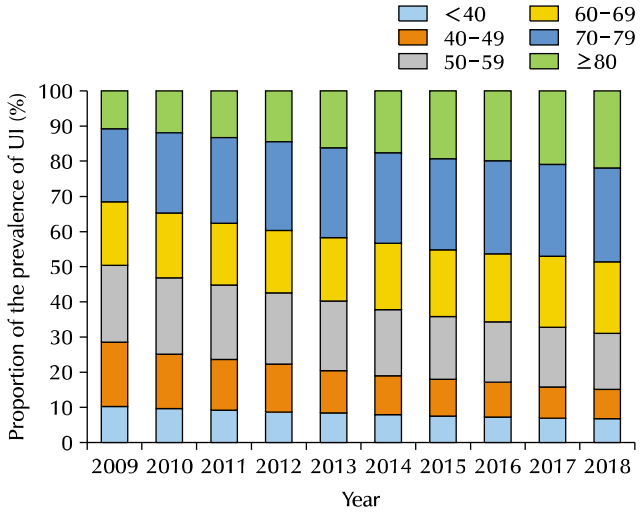

Fig. 5. Proportion of the prevalence of urinary incontinence (UI) by the age group during a 10-year period.

prevalence of BPH. The prevalence proportions of the 70-79 years and ≥80 year age groups increased from 29.8% and 10.9% in 2009 to 36.1% and 17.5% in 2018, respectively (Fig. 4). There were statistically significant increases in the crude prevalence of BPH observed over the 10 years in all six age groups (p for trend <0.05).

3. UI

The proportion of the prevalence of UI by age exhibited a similar pattern to the overall proportion of the prevalence of LUTD. The proportions of the elderly population (60-69, 70-79, and ≥80 years) tended to increase over a 10-year period compared to the younger population (Fig. 5). The prevalence proportions of 60-69, 70-79, and ≥80 age groups increased from 17.9%, 21.2%, and 10.4% in 2009 to 20.6%, 26.5%, and 22.0% in 2018, respectively. Although the proportion of UI in the other three age groups (<40, 40-49, and 50-59 years) decreased with age, there were statistically significant increases in the crude prevalence of UI over the 10 years in all six age groups (p for trend <0.05).

DISCUSSION

In this study, the proportion of prevalence of LUTD increased gradually with age, and those over 60 years accounted for approximately 60% of LUTD cases. The proportion of the prevalence in the age groups over 70 years increased continuously from 2009 to 2018. The prevalence of LUTD according to age in men and women showed a similar pattern to that of the overall LUTD prevalence, and there was no significant difference in proportion between men and women.

Although the prevalence of LUTD varied, due primarily to different definitions of the dysfunction, the estimated prevalence of LUTD in Korea was similar to those in other countries [8]. The average age of the Korean population is increasing more rapidly than in other countries; the proportion of the population over 65 years of age increased from 10.5% in 2009 to 17.5% in 2022 [1,7]. Considering that aging is a major causal factor of LUTD, the increase in the prevalence of LUTD among the elderly may be more pronounced in Korea. This study confirmed this trend between aging and LUTD in Korea. On the other hand, there was no significant difference in the prevalence proportion of LUTD between men and women over the 10-year period.

The changes in the proportions of the prevalence of BPH and UI according to age were consistent with that of the overall prevalence of LUTD. A previous study reported that the prevalence of BPH, defined by an International prostate symptom score of ≥8 points, was 18%, 29%, 40%, and 56% among men in their 40s, 50s, 60s, and 70s or older, respectively. Asians appeared to have similar or worse LUTS than Caucasians [9]. Although the definition of LUTD in this study was based on specific codes, such as KCD-8, the finding that men aged 60 years and above constituted approximately over 70% of all BPH patients is consistent with a previous study [9]. In addition, BPH is one of the most common diseases in aging men, which can lead to voiding difficulty.

Furthermore, the prostate volume increases with age, based on a longitudinal aging study, suggesting a prostate growth rate of 2.0–2.5% per year in older men [10,11]. Observational studies from the United States, Europe, and Asia have shown that older age is an associated risk factor for the onset and progression of BPH [12–15]. These results show a gradual increase in the prevalence of BPH among the elderly from 2009 to 2018 (p for trend <0.05). In 2018, approximately 80% of the population with BPH was aged over 60. Furthermore, the prevalence proportion in men over 60 increased significantly over the 10-year period. Therefore, this study confirmed that BPH prevalence increases with age, with the highest prevalence observed in participants aged 70 years and above.

Many women suffer from UI due to childbirth and aging. In 2004, the study included an internet survey including 3,372 responders. The prevalence of UI in women was 21% [16]. Another study based on a telephone survey reported that the overall prevalence of UI was 40.8% among 1,301 women [17]. Among the various factors affecting the incidence of UI in women, age, delivery rate, obesity, education, and smoking are well-known risk factors [18]. In addition, previous studies reported that UI is an age-related condition, and more than 40% of women in their 70s are reported to have symptoms [3,18,19]. In the present study, the distribution of patients with UI according to the age group was higher among the elderly, and approximately 80% of those diagnosed with UI were over 50 years old.

This study had several limitations. First, this study may not reflect the actual prevalence of LUTD as a population-based analysis using Korean National Health information data based on medical insurance claims data. Second, the data on UI prevalence included all men and women. Therefore, the data do not show the prevalence of UI in women separately because this study focused on the overall prevalence of LUTD. In addition, the prevalence of stress UI, which is a widespread disease in women, was not reported separately in this study.

Nevertheless, this study revealed changes in the proportion of the prevalence of LUTD in South Korea because Korean National Health Information data is a nationwide repository of population-based cohort data that covers comprehensive medical services to all citizens of South Korea.

CONCLUSIONS

With a changing demographic profile and an increasingly aging population, LUTD will inevitably become more prevalent and a major challenge across all healthcare levels. Based on this study, LUTD was more prevalent in the elderly aged over 60 years old than in younger adults. Given South Korea's expected transition to the world's most aged population, this study suggests the development of nationwide healthcare policies to manage LUTD in the elderly population.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

FUNDING

This research was supported by a grant from the Korea Prostate & Voiding Health Association.

AUTHOR CONTRIBUTIONS

Y.H.K. contributed to collecting data, performing statistical analysis, and drafting the manuscript. S.H.H. contributed to collecting data, providing statistical advices, and performing statistical analysis. T.W.K. contributed to helping to draft the manuscript and providing clinical advices. H.C.C., T.H.K., S.C.K., and S.B.K. contributed to providing clinical advices. J.H.J. contributed to providing clinical advices and final approval.

ORCID

Young Hwan Kim, https://orcid.org/0000-0002-9893-7429
Se Hwa Hong, https://orcid.org/0000-0003-2576-9062
Tae Wook Kang, https://orcid.org/0000-0003-4236-0664
Hyun Chul Chung, https://orcid.org/0000-0002-3450-7817
Tae Hyoung Kim, https://orcid.org/0000-0002-0257-3449
Sae Chul Kim, https://orcid.org/0000-0002-2040-4251
Sang Baek Koh, https://orcid.org/0000-0001-5609-6521
Jae Hung Jung, https://orcid.org/0000-0002-4990-7098

SUPPLEMENTARY MATERIALS

Supplementary data can be found via https://doi.org/10.14777/uti.2023.18.3.101.

REFERENCES

1. Baek JY, Lee E, Jung HW, Jang IY. Geriatrics fact sheet in Korea 2021. Ann Geriatr Med Res 2021;25:65-71.
2. Yoo TK, Lee KS, Sumarsono B, Kim ST, Kim HJ, Lee HC, et al. The prevalence of lower urinary tract symptoms in population aged 40 years or over, in South Korea. Investig Clin Urol 2018;59:166-76.
3. Irwin DE, Milsom I, Hunskaar S, Reilly K, Kopp Z, Herschorn S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. Eur Urol 2006;50:1306-14; discussion 1314-5.
4. Kupelian V, Wei JT, O'Leary MP, Kusek JW, Litman HJ, Link CL, et al.; BACH Survery Investigators. Prevalence of lower urinary tract symptoms and effect on quality of life in a racially and ethnically diverse random sample: the Boston Area Community Health (BACH) Survey. Arch Intern Med 2006;166:2381-7.
5. Boyle P, Robertson C, Mazzetta C, Keech M, Hobbs FD, Fourcade R, et al.; UrEpik Study Group. The prevalence of lower urinary tract symptoms in men and women in four centres. The UrEpik study. BJU Int 2003;92:409-14.
6. Trueman P, Hood SC, Nayak US, Mrazek MF. Prevalence of lower urinary tract symptoms and self-reported diagnosed 'benign prostatic hyperplasia', and their effect on quality of life in a community-based survey of men in the UK. BJU Int 1999;83:410-5.
7. Korean Statistical Information Service [Internet]. Daejeon: Statistics Korea; 2023 [cited 2023 Aug 25]. Available from: https://kosis.kr/index/index.do
8. Choi H, Bae JH. Overview of the epidemiology of lower urinary tract dysfunction in South Korea. Int Neurourol J 2016;20:91-100.
9. Xia SJ, Cui D, Jiang Q. An overview of prostate diseases and their characteristics specific to Asian men. Asian J Androl 2012;14:458-64.
10. Bosch JL, Tilling K, Bohnen AM, Bangma CH, Donovan JL. Establishing normal reference ranges for prostate volume change with age in the population-based Krimpen-study: prediction of future prostate volume in individual men. Prostate 2007;67:1816-24.
11. Loeb S, Kettermann A, Carter HB, Ferrucci L, Metter EJ, Walsh PC. Prostate volume changes over time: results from the Baltimore longitudinal study of aging. J Urol 2009;182:1458-62.
12. Guess HA, Arrighi HM, Metter EJ, Fozard JL. Cumulative prevalence of prostatism matches the autopsy prevalence of benign prostatic hyperplasia. Prostate 1990;17:241-6.
13. Kok ET, Schouten BW, Bohnen AM, Groeneveld FP, Thomas S, Bosch JL. Risk factors for lower urinary tract symptoms suggestive of benign prostatic hyperplasia in a community based population of healthy aging men: the Krimpen Study. J Urol 2009;181:710-6.
14. Taylor BC, Wilt TJ, Fink HA, Lambert LC, Marshall LM, Hoffman AR, et al.; Osteoporotic Fractures in Men (MrOS) Study Research Group. Prevalence, severity, and health correlates of lower urinary tract symptoms among older men: the MrOS study. Urology 2006;68:804-9.
15. Lee SWH, Chan EMC, Lai YK. The global burden of lower urinary tract symptoms suggestive of benign prostatic hyperplasia: a systematic review and meta-analysis. Sci Rep 2017;7:7984.
16. Kim UH, Kim YH, Kim ME. The prevalence and quality of life of overactive bladder and urinary incontinence in young women. Korean J Urol 2004;45:543-50.
17. Choo MS, Ku JH, Oh SJ, Lee KS, Paick JS, Seo JT, et al. Prevalence of urinary incontinence in Korean women: an epidemiologic survey. Int Urogynecol J Pelvic Floor Dysfunct 2007;18:1309-15.
18. Milsom I, Gyhagen M. The prevalence of urinary incontinence. Climacteric 2019;22:217-22.
19. Stewart WF, Van Rooyen JB, Cundiff GW, Abrams P, Herzog AR, Corey R, et al. Prevalence and burden of overactive bladder in the United States. World J Urol 2003;20:327-36.