Lower urinary tract symptoms and functional ability in older adults: a community-based cross-sectional study

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ABSTRACT

Objectives Functional ability, or the ability to live actively in older age, is essential for healthy ageing. This study assessed the association between the five types of lower urinary tract symptoms (LUTS) and functional ability among community-dwelling older adults (>65 years old).

Design A cross-sectional study.

Setting Community-dwelling older adults (>65 years old) randomly selected from the basic resident register of Kashiwa city as part of the Kashiwa study.

Participants The study included 916 community-dwelling older adults (481 male participants) in Japan.

Outcome measures A self-administered questionnaire was used to collect data regarding LUTS, which included frequency, nocturia, urgency, urinary incontinence and overactive bladder (OAB). Functional ability was measured using the Japan Science and Technology Agency Index of Competence. Sex-stratified logistic regression analyses were conducted, adjusting age, obesity, alcohol consumption, polypharmacy and comorbidities.

Results Male participants experienced symptoms of frequency, nocturia, urgency, urinary incontinence and OAB at rates of 68.0%, 89.0%, 16.0%, 3.7% and 4.3%, respectively. Female participants experienced these symptoms at rates of 68.3%, 80.0%, 11.0%, 7.4% and 8.5%, respectively. Among male participants, lower functional ability was only associated with nocturia (>3 times/night) (adjusted OR (AOR): 1.71, 95% CI 1.05 to 2.79). Contrarily, lower functional ability among female participants was significantly associated with frequency (AOR: 1.61, 95% CI 1.04 to 2.49), urgency (AOR: 2.06, 95% CI 1.08 to 3.95) and OAB (AOR: 2.43, 95% CI 1.15 to 5.11).

Conclusion The different associations between LUTS and functional ability by sex might be related to differences in the effect of comorbidities and physical fatigue. Our results help clarify the multifaceted effects of LUTS in old age, the need for early detection and treatment of LUTS, and the importance of maintaining functional ability.

INTRODUCTION

The concept of ‘healthy ageing’ provides a different perspective regarding the quality of life (QOL) of older adults1 and was defined by the WHO as ‘the process of developing and maintaining the functional ability that enables well-being in older age’.2 Functional ability includes a person’s ability to fulfil their basic needs, learn, grow, make decisions, be mobile, build and maintain relationships and contribute to society. This perspective reframes older adults as individuals who can facilitate their healthy ageing rather than being passive receivers of support. Moreover, the maintenance of functional ability to achieve healthy ageing is becoming an important theme in countries with ageing populations.3

Lower urinary tract symptoms (LUTS) include problems with storage, voiding or post-micturition functions and are not limited to specific sexes, ages or regions.4 A study using the International Continence Society’s definitions estimated that 45.2% of the global population of individuals who are >20 years old have at least one LUTS.5 Furthermore, LUTS are more prevalent among older adults, with one international population-based study estimating that 80.7% of older men and 79.3% of older women (>60 years old) have at least one type of LUTS, such as nocturia.6 However, despite the high prevalence of LUTS, the consultation rate remains low.7 As global population ageing continues, the proportion of individuals suffering from LUTS might increase, especially among older adults.8,9

The presence of LUTS can negatively affect individuals’ QOL,10,11 and storage-related symptoms (eg, nocturia, urgency or urinary

Strengths and limitations of this study

 ► The study participants were selected from randomly recruited older adults in a city.
 ► Functional ability, an essential concept for healthy ageing, was measured using a comprehensive scale.
 ► Recall bias is undeniable because a self-administered questionnaire was used to measure lower urinary tract symptoms.
 ► A cross-sectional design precludes a conclusion regarding the causality of the relationship.
incontinence) have negative and significant detrimental effects on people’s QOL. For example, nocturia (≥2 times/night) can lead to decreased QOL due to interrupted sleep, falls on the way to the toilet and fall-related fractures. Urinary incontinence also affects QOL, which is related to the severity, type and number of incontinence episodes. Moreover, QOL tends to decrease with age, suggesting that older adults face a double burden of increased LUTS and decreased QOL.

In recent years, studies have been conducted to clarify the association between LUTS and more complex abilities than activities of daily living (ADL). An American study analysed data from the National Health and Nutrition Examination Surveys and found a significant association between urinary incontinence and functional limitations, such as difficulty stooping, crouching or kneeling, in women in the community. In a longitudinal study of community-dwelling older men, the risk of onset of functional limitations (mobility, ADL and cognitive dysfunctions) 2 years later was examined in relation to the severity of LUTS. The results showed that the more severe the LUTS, the worse the mobility and ADL, but not cognitive dysfunction. In order to promote healthy ageing, it will be important to add the research considering the association between various types of LUTS and more complex abilities. Therefore, this study aimed to compare five types of LUTS with a comprehensively assessed functional ability in community-dwelling older adults.

MATERIAL AND METHODS

We used the Strengthening the Reporting of Observational Studies in Epidemiology cross-sectional reporting guidelines.

Participants

The study participants were selected from a community-based study in Kashiwa city, Japan (the Kashiwa study). The Kashiwa study evaluated 2044 community-dwelling older adults (≥65 years old) who were randomly selected from the basic resident register of Kashiwa city in 2012. Surveys were performed every 1–2 years, and the present study evaluated information on participants of the 2016 survey when questions regarding LUTS were introduced. A total of 1339 individuals who were not in long-term care participated in the 2016 survey. Among them, we excluded 423 individuals with cognitive dysfunction (Mini-Mental State Examination score of ≤23) to ensure the reliability of the data collected by the self-administered questionnaire, gait problems (whether they reported that they could walk without any help) to eliminate the effects of physical movement restrictions on functional ability and LUTS, or missing data regarding the main variables. Finally, the present study evaluated data from 916 participants (481 male participants and 435 female participants).

Functional ability

In this study, we evaluated functional ability using the Japan Science and Technology Agency Index of Competence (JST-IC). The JST-IC is a validated scale to measure the level of overall competence to live actively in older age with 16 items regarding new device use, information collection, life management and social participation (Figure 1). The original Japanese version of the JST-IC was used in the research. The scores range from 0 to 16, with higher scores indicating greater functional ability.

Lower urinary tract symptoms

To collect data on the five types of LUTS (frequency, nocturia, urgency, urinary incontinence and overactive bladder (OAB)), we used a self-administered questionnaire regarding the frequency of urination during the day and night, urgency and urinary incontinence. Frequency was defined as ≥8 urinations during the day, while nocturia was defined as ≥1 urination during the night. Urgency was defined as ‘a compelling need to urinate, due to pain or an unpleasant sensation, that is difficult to defer’ and the number of urinary incontinent episodes was recorded. We also considered the presence of OAB, which is clinically important and prevalent among older adults, which we defined as the occurrence of urgency with frequency or nocturia.

Other variables

Based on previous studies regarding LUTS, the following variables were selected as possible confounding factors: age, obesity (body mass index (BMI) of ≥25 kg/m²), alcohol consumption (≥5 times/week), polypharmacy (≥5 drugs/day) and comorbidities (hypertension, heart disease, diabetes and dyslipidaemia).

Data analysis

Considering that the characteristics of LUTS differ depending on sex, the participants were stratified according to sex. The distribution of all variables, sex differences and the crude associations between the five types of LUTS and JST-IC were examined by univariate analysis. Since no clear cut-off value has been set for JST-IC, we initially planned to treat it as a continuous variable. However, we changed to treat it as a categorical
variable using the median (=12) for the multivariate analyses due to the collected data that was not normally distributed (Shapiro-Wilk test, p<0.05). To determine the association of each LUTS with functional ability by sex, logistic regression analyses predicting lower JST-IC were run with the following independent variables: each LUTS (frequency, nocturia (≥1 time/night, 2 times/night or ≥3 times per night), urgency, urinary incontinence or OAB), age, obesity, alcohol intake, polypharmacy and comorbidities (hypertension, heart disease, diabetes and dyslipidaemia). As the dependent variable of the logistic regression analyses, the binary variable of JST-IC in which the high and low scores were reversed was used. All statistical analyses were performed using SPSS Statistics for Windows, V.27.0, and differences were considered statistically significant at p values of <0.05.

### Patients and public involvement

The participants were not involved in the design, conduct, reporting or dissemination plans of our research. However, the study results will be available to the participants and the public through the open-access journal article.

### RESULTS

Table 1 lists the participants’ characteristics stratified by sex. Male participants had significantly higher proportions

**Table 1  Characteristics of participants**

| Characteristics          | Total n=916 | Male participants n=481 | Female participants n=435 | P value |
|--------------------------|------------|-------------------------|---------------------------|---------|
| **Age (years)**          |            |                         |                           |         |
| Mean, SD                 | 76.3, 5.1  | 76.5, 5.2               | 76.1, 5.0                 |         |
| **JST-IC**               |            |                         |                           |         |
| ≥12                      | 488 (53.3) | 258 (53.6)              | 230 (52.9)                | 0.82    |
| <12                      | 428 (46.7) | 223 (46.4)              | 205 (47.1)                |         |
| **Obesity**†             |            |                         |                           |         |
| BMI≥25                   | 199 (22.0) | 121 (25.6)              | 78 (18.1)                 | 0.01    |
| BMI<25                   | 704 (78.0) | 351 (74.4)              | 353 (81.9)                |         |
| **Alcohol consumption†** |            |                         |                           |         |
| ≥5 times/week            | 250 (27.3) | 213 (44.3)              | 37 (8.5)                  | <0.01   |
| <5 times/week            | 665 (72.7) | 268 (55.7)              | 397 (91.5)                |         |
| **Polypharmacy†**        |            |                         |                           |         |
| ≥6 drugs/day             | 151 (16.6) | 92 (19.2)               | 59 (13.7)                 | 0.03    |
| <6 drugs/day             | 758 (83.4) | 386 (80.8)              | 372 (86.3)                |         |
| **Comorbidities**        |            |                         |                           |         |
| Hypertension Yes         | 407 (44.4) | 238 (49.5)              | 169 (38.9)                | <0.01   |
| No                       | 509 (55.6) | 243 (50.5)              | 266 (61.1)                |         |
| Heart disease Yes        | 123 (13.4) | 85 (17.7)               | 38 (8.7)                  | <0.01   |
| No                       | 793 (86.6) | 396 (82.3)              | 397 (91.3)                |         |
| Diabetes Yes             | 101 (11.0) | 68 (14.1)               | 33 (7.6)                  | <0.01   |
| No                       | 815 (89.0) | 413 (85.9)              | 402 (92.4)                |         |
| Dyslipidaemia Yes        | 307 (33.5) | 123 (25.6)              | 184 (42.3)                | <0.01   |
| No                       | 609 (66.5) | 358 (74.4)              | 251 (57.7)                |         |
| **LUTS**                 |            |                         |                           |         |
| Frequency ≥8 times/day   | 624 (68.1) | 327 (68.0)              | 297 (68.3)                | 0.92    |
| No                       | 392 (31.9) | 154 (32.0)              | 238 (51.7)                |         |
| Nocturia ≥1 time/night   | 776 (84.7) | 428 (89.0)              | 348 (80.0)                | <0.01   |
| ≥2 times/night           | 419 (45.7) | 267 (55.5)              | 152 (34.9)                | <0.01   |
| ≥3 times/night           | 136 (14.8) | 99 (20.6)               | 37 (8.5)                  | <0.01   |
| Urgency ≥1 time/day      | 125 (13.6) | 77 (16.0)               | 48 (11.0)                 | 0.03    |
| Urinary incontinence ≥1 time/day | 50 (5.5) | 18 (3.7)               | 32 (7.4)                  | 0.02    |
| OAB                      | 106 (11.6) | 69 (14.3)               | 37 (8.5)                  | <0.01   |

*Obesity was defined according to the Japanese guideline.38
†Missing cases: 13 in obesity, 1 in alcohol consumption and 7 in polypharmacy.
BMI, body mass index; JST-IC, Japan Science and Technology Agency Index of Competence; LUTS, lower urinary tract symptom; OAB, overactive bladder (frequency and nocturia (≥1) and urgency).
of obesity, alcohol consumption, polypharmacy, comorbidities (hypertension, heart disease and diabetes) and three types of LUTS (nocturia, urgency and OAB). On the other hand, female participants had significantly higher proportions of dyslipidemia and urinary incontinence. Crude associations between each LUTS and the total score of JST-IC or its four components (new device use, information collection, life management and social participation) are listed in online supplemental tables.

DISCUSSION

The results indicated that nocturia (≥3 times/night) was significantly associated with lower functional ability among male participants; it was significantly associated with frequency, urgency and OAB among female participants. Thus, the association of LUTS with functional ability may vary according to sex.

Nocturia was more prevalent and influential in male participants than in female participants. One of the reasons for this may be the influence of comorbidities. Male participants were more likely to have hypertension, heart disease and diabetes, which are known as risk factors for nocturia. It is possible that these comorbidities increase nighttime urination and, at the same time, have a negative impact on various daytime activities. In addition, it is necessary to consider the effects of polypharmacy. As shown in table 1, male participants were taking more drugs than female participants. In recent years, it is known that an increase in the number of medications taken by older adults leads to adverse events. Taking high doses of drugs for the treatment of comorbidities may lead to polypharmacy and reduce functional ability. Another possibility is that alcohol intake has an effect. It is known that even a small amount of alcohol has an adverse effect on health. In this study, male participants consumed more alcohol, which may have a negative impact on the health that underpins functional ability. Thus, the effect of nocturia may be judged to be more serious among male participants.

Lower functional ability was significantly associated with frequency, urgency and OAB only among female participants. This could be explained by the physical differences between male participants and female participants. As shown in table 1, female participants had a lower BMI. Weight loss and fatigue in old age are strongly associated with each other and even cause frailty. Toileting is a complex physical activity, and frequent toileting requires more physical strength and endurance. Older female participants with lower weight could be more likely to have physical fatigue due to frequent toileting, and it could lead to lower functional ability.

The present study had several limitations. First, recall bias is undeniable because a self-administered questionnaire was used to measure the frequency of urination,
urgency and urinary incontinence. However, we aimed to minimise the possibility of underestimation or overestimation by double-checking the responses with the participants when the questionnaires were collected. Second, the relatively small sample size could have affected the results, and the cross-sectional design precludes a conclusion regarding the causality of the relationship between LUTS and competence. A well-designed prospective study with a larger sample size is needed to deeply evaluate the causality of this relationship and the related mechanism(s).

This study examined the association between five types of LUTS and functional ability for healthy ageing. Among male participants, lower functional ability was associated with nocturia (≥3 times/night) only, while it was associated with frequency, urgency and OAB among female participants. These sex-based differences may be due to the sex-related difference in the effect of comorbidities and physical fatigue. Our results help clarify the multifaceted effects of LUTS in old age, the need for early detection and treatment of LUTS, and the importance of maintaining functional ability.

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Competing interests None declared.

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Patient consent for publication Not applicable.

Ethics approval This study involves human participants. The study protocol was approved by the ethics committee of the University of Tokyo (approval numbers: 12-8 and 18-166). Participants gave informed consent to participate in the Kashiwa study before taking part.

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