

# The prevalence of lower urinary tract symptoms (LUTS) in Brazil: Results from the epidemiology of LUTS (Brazil LUTS) study

Roberto Soler<sup>1</sup> | Cristiano Mendes Gomes<sup>2</sup> | Marcio Augusto Averbeck<sup>3</sup>  | Mitti Koyama<sup>4</sup>

<sup>1</sup> Astellas Pharma Brazil, São Paulo, Brazil

<sup>2</sup> University of São Paulo School of Medicine, São Paulo, Brazil

<sup>3</sup> Department of Urology, Moinhos de Vento Hospital, Porto Alegre, Brazil

<sup>4</sup> Kamiyama Statistical Consulting, São Paulo, Brazil

## Correspondence

Roberto Soler, Astellas Pharma Brazil, Avenida Nações Unidas 14171-4 andar, São Paulo, Brazil.  
Email: roberto.soler@astellas.com

## Funding information

Astellas Farma Brasil; Astellas Pharma Global Development

**Aims:** We performed the first large population-based study to evaluate lower urinary tract symptoms (LUTS) in Brazil. The study objective was to assess the prevalence and bother of LUTS in the population aged  $\geq 40$  years in five major cities of Brazil.

**Methods:** This study was conducted as a telephone survey with assessment of LUTS using a standardized protocol, which included the International Prostate Symptom Score (IPSS) and, for overactive bladder (OAB), the OAB-V8 questionnaire. Participants were asked to rate how often they experienced individual LUTS and the degree of associated bother.

**Results:** Of the 5184 participants, 53% were women, and the age group with most participants (34%) was 50-59 years. The prevalence of LUTS (symptoms occurring less than half the time or more) was 75%: 69% in men and 82% in women. There was a statistically significant association between the frequency and bother intensity of each symptom ( $P < 0.001$ ). The prevalence of OAB was similar in men and women (25% and 24%, respectively). According to the IPSS questionnaire, moderate-to-severe symptoms were present in 21% of men and 24% of women. LUTS detrimentally affected quality of life in many individuals: 39% would be “mostly dissatisfied,” “unhappy,” or consider it “terrible” to spend the rest of their life with their urinary condition as it is currently.

**Conclusions:** This was the first nationwide, population-based epidemiological study of LUTS to be performed in Brazil. LUTS are highly prevalent and often bothersome among men and women aged  $\geq 40$  years.

## KEYWORDS

Brazil, lower urinary tract symptoms, men, prevalence, women

Affiliation at the time of the study for Marcio Augusto Averbeck: Department of Urology, Moinhos de Vento Hospital, Porto Alegre, Brazil.

Clinical trials registration number: study not registered as it is an epidemiological study rather than a clinical trial.

Dr. Alan Wein led the peer-review process as the Associate Editor responsible for the paper.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2017 The Authors. *Neurourology and Urodynamics* Published by Wiley Periodicals, Inc.

## 1 | INTRODUCTION

Lower urinary tract symptoms (LUTS) is an umbrella term for a wide variety of storage, voiding and post-micturition symptoms.<sup>1</sup> Large, international studies conducted in Europe and North America have reported that the prevalence of LUTS is over 60% in men and women aged >40 years.<sup>2,3</sup>

No population-based studies have been published on the prevalence of LUTS across the whole of Brazil, one of the largest and most demographically diverse countries in the world. However, several LUTS studies have been performed in single cities of Brazil. One such study was performed in adults aged  $\geq 30$  years in Salvador, a city in the Northeastern region, and found that 67% of both men and women had LUTS according to International Continence Society (ICS) definitions, with nocturia defined as at least two episodes per night.<sup>4</sup> The prevalence of urinary incontinence (UI) in 519 adults aged  $\geq 18$  years was reported to be 20% in a study performed in Pouso Alegre, Minas Gerais.<sup>5</sup> In another study, 657 residents of São Paulo were interviewed using a survey with questions regarding UI and nocturia.<sup>6</sup> Current UI, sporadic UI, and UI upon moderate efforts were present in 11%, 51%, and 74% of the participants.

The impact of LUTS is wide-ranging and significant, with impairment of quality of life, social functioning, sexual quality of life, and workplace productivity.<sup>7</sup> These factors, particularly workplace productivity, can result in economic effects. There is considerable need to understand the extent of the problem, and to ensure that affected individuals are treated effectively.

Overactive bladder (OAB), which is defined by the ICS as urgency, with or without urgency incontinence, usually with frequency and nocturia, is also likely to cause bothersome symptoms that affect sleep, mental health, and work productivity.<sup>7</sup> A survey in Porto Alegre, Brazil reported that OAB affects 19% of individuals aged 15-55 years.<sup>8</sup>

We performed a cross-sectional study to determine the prevalence and bother of LUTS and OAB in adults aged  $\geq 40$  years in five major cities, each from a different geographic region of Brazil.

## 2 | MATERIALS AND METHODS

We conducted a computer-assisted telephone survey between 1 September and 31 December 2015. Study participants were adults aged  $\geq 40$  years with residential phone lines (landlines) residing in major cities from each of the five geographical regions of Brazil: São Paulo (Southeast), Porto Alegre (South), Recife (Northeast), Belém (North) and Goiânia (Central-west). Pregnant women and individuals who reported a current or past (within 1 month) urinary tract infection were excluded. Selection procedures are outlined below and the telephone interviews are detailed in supplementary information.

The study was approved by a local ethics committee (Ethics Committee of Faculdade de Medicina da Universidade de São Paulo) and was performed in compliance with Good Clinical Practice and in accordance with the Declaration of Helsinki. Informed consent was provided by all participants.

LUTS were assessed using a standardized protocol based on ICS definitions.<sup>1</sup> The *International Prostate Symptom Score (IPSS)*<sup>9</sup> and the *Overactive Bladder—Validated 8-question Screener (OAB-V8)*<sup>10</sup> questionnaires were also included. All terms and questionnaires were validated in Portuguese. Participants were asked to rate how often they experienced individual LUTS during the past month (at least one voiding, storage [nocturia, two or more episodes] or post-micturition symptom). A Likert scale was used with the following options: none (score 0), <1 in 5 times (score 1), <half the time (score 2), about half the time (score 3), >half the time (score 4), or almost always (score 5). The degree of associated bother was also assessed (Likert scale: not at all [score 0], a little bit [score 1], somewhat [score 2], quite a bit [score 3], a great deal [score 4], or a very great deal [score 5]).

The primary study objective was to estimate the prevalence and associated symptom bother of LUTS in men and women aged  $\geq 40$  years in five major cities in Brazil. Two definitions were used for the presence of LUTS: definition 1 (Likert score 2-5; symptoms occurring less than half the time or more), and definition 2 (Likert score 3-5; symptoms occurring half the time or more). Secondary endpoints included the bother of LUTS, prevalence of specific symptoms, prevalence of OAB, and quality of life according to IPSS (question 8).

The sample size was calculated based on the population age distribution and expected LUTS prevalence rates (17.0-30.0% in men and 17.8-22.5% in women).<sup>11</sup> Assuming a coefficient of variation of 0.15, a sample size of 1000 interviews in each of the five cities was calculated to exceed the required sample size for estimating LUTS prevalence. Telephone numbers of potential study participants were selected randomly, with stratification by zip code to ensure equal representation by city.

Data were weighted to compensate for differences in the probabilities of respondent selection. Depending on the random selection of a resident within each household, data were weighted initially according to number of residents then by number of telephones. To reduce potential bias due to landline coverage and non-response, data were further adjusted post-stratification, matching respondents' distribution by age, sex and education to that observed for each city's population in the 2010 census.

Descriptive statistics were used for initial data analysis. Chi-squared tests evaluated differences in LUTS prevalence between the sexes and between age groups. In addition, linear association between frequency and bother of symptoms was evaluated using Spearman's rank correlation coefficient. All statistical analyses were performed using SPSS (v20 for Microsoft Windows).

### 3 | RESULTS

A total of 17 600 telephone numbers were called, and 11 483 individuals met the eligibility criteria. Refusals were received from 2959 individuals (26%), and the interview was not completed by 3340 individuals (29%) for other reasons (rescheduled interviews, interrupted calls, calls not answered). Thus, 5184 individuals (45%) completed the interview: 1004 from São Paulo, 1002 from Porto Alegre, 1013 from Recife, 1004 from Belém, and 1161 from Goiânia. Demographic characteristics are shown in Table 1. Women comprised 53% of study participants, and the age group with most participants (34%) was 50-59 years.

#### 3.1 | Prevalence of LUTS

Using definition 1, the prevalence of LUTS was 75% (69% in men and 82% in women;  $P < 0.001$ ). The corresponding values using definition 2 were 49% (40% and 59%;  $P < 0.001$ ). The prevalence of LUTS increased with age (Figure 1; definition 1:  $P < 0.001$  in men and in women). In

women aged  $\geq 70$  years, 95.6% had LUTS occurring about half the time or more, compared with 71.3% of men.

Symptoms with the highest overall prevalence were perceived frequency and nocturia (Table 2). Terminal dribble and slow stream were the most common voiding symptoms. In general, voiding symptoms were more common in men than women, while storage symptoms were more common in women. The most common voiding symptom, terminal dribble, affected 25.2% of men and 17.7% of women, while perceived frequency (the most common storage symptom) was present in 27.7% of men and 32.3% of women. The most prevalent ICS symptom category in both men and women was storage (55.1% and 76.9%, respectively for definition 1 and 29.4% and 53.5%, respectively for definition 2).

When considering symptom subtypes and combinations (Figure 2), using definition 1, the most common LUTS subtype was storage symptoms alone in both men (prevalence: 20.6%) and women (36.4%). The second and third most common subtypes/combinations were voiding plus storage symptoms, and the combination of all three subtypes. With definition 2, the most common subtype remained storage symptoms only, with prevalence rates of 13.3% and 30.0% in

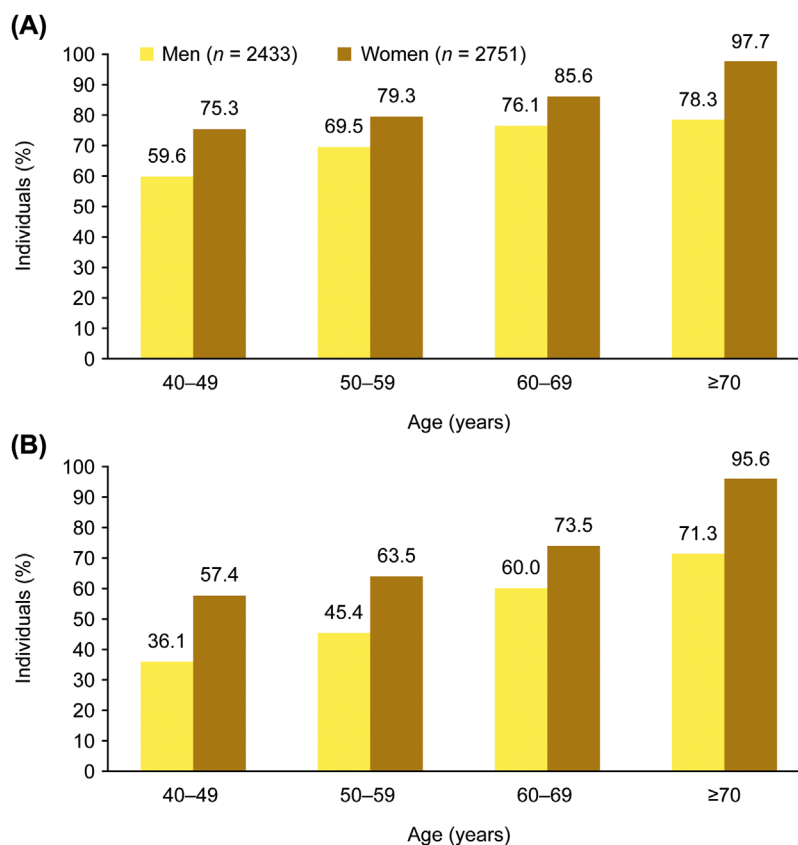
**TABLE 1** Demographic characteristics of the study population ( $n = 5184$ )

|                                  | Men  |       | Women |       | Total |       | P-value |
|----------------------------------|------|-------|-------|-------|-------|-------|---------|
|                                  | n    | %     | n     | %     | n     | %     |         |
| Age category                     | 2433 | 100.0 | 2751  | 100.0 | 5184  | 100.0 | 0.032   |
| 40-49                            | 755  | 31.0  | 713   | 25.9  | 1467  | 28.3  |         |
| 50-59                            | 826  | 34.0  | 951   | 34.6  | 1777  | 34.3  |         |
| 60-69                            | 499  | 20.5  | 579   | 21.0  | 1078  | 20.8  |         |
| $\geq 70$                        | 353  | 14.5  | 509   | 18.5  | 862   | 16.6  |         |
| Marital status                   | 2416 | 100.0 | 2743  | 100.0 | 5159  | 100.0 | <0.001  |
| Single                           | 239  | 9.9   | 496   | 18.1  | 735   | 14.2  |         |
| Married or living with a partner | 1892 | 78.3  | 1222  | 44.6  | 3114  | 60.4  |         |
| Separated or divorced            | 155  | 6.4   | 388   | 14.1  | 543   | 10.5  |         |
| Widower                          | 130  | 5.4   | 637   | 23.2  | 767   | 14.9  |         |
| Education level                  | 2433 | 100.0 | 2751  | 100.0 | 5184  | 100.0 | 0.001   |
| Illiterate/no education          | 85   | 3.5   | 147   | 5.3   | 232   | 4.5   |         |
| Incomplete elementary education  | 599  | 24.6  | 873   | 31.7  | 1472  | 28.4  |         |
| Complete elementary education    | 1079 | 44.3  | 1115  | 40.5  | 2193  | 42.3  |         |
| College education                | 670  | 27.5  | 618   | 22.5  | 1288  | 24.8  |         |
| Working situation                | 2386 | 100.0 | 2707  | 100.0 | 5092  | 100.0 | <0.001  |
| Unemployed                       | 187  | 7.8   | 160   | 5.9   | 347   | 6.8   |         |
| Inactive <sup>a</sup>            | 716  | 30.0  | 603   | 22.3  | 1319  | 25.9  |         |
| Active <sup>b</sup>              | 1351 | 56.7  | 615   | 22.7  | 2282  | 44.8  |         |
| Other <sup>c</sup>               | 132  | 5.5   | 1329  | 49.1  | 1144  | 22.5  |         |

<sup>a</sup>Inactive includes permanently disabled and retired individuals.

<sup>b</sup>Active includes individuals who were employed, self-employed, owners of own business/service/professional practice, or autonomous.

<sup>c</sup>Other includes housewife/husband, stipendiary, and others (i.e. not in the above categories).



**FIGURE 1** Prevalence of LUTS according to the two study definitions: definition 1 (symptoms occurring less than half the time or more; (A) and definition 2 (symptoms occurring about half the time or more; (B). LUTS, lower urinary tract symptoms

men and women, respectively. Approximately 40-50% of individuals with LUTS according to either definition 1 or definition 2 had more than one symptom subtype.

The most bothersome symptoms among men were urgency with fear of leaking, urgency urinary incontinence (UUI), and stress urinary incontinence (SUI; Table 2). In women, the most bothersome symptoms were leaking for no reason, nocturnal enuresis and post-micturition dribble. The prevalence of both at least “quite a bit” was numerically higher in women than men for all symptoms except hesitancy.

There was a statistically significant association between the frequency and bother intensity of each symptom ( $P < 0.001$ ; Table 3). The correlation coefficients for these relationships ranged from 0.504 (nocturia in men) to 0.984 (leaking during sexual activity in women). The highest correlation coefficients ( $\geq 0.9$ ) were all observed with storage symptoms: nocturnal enuresis in men and women, leaking for no reason in women and leaking during sexual activity in women.

### 3.2 | Prevalence of OAB

The prevalence of OAB according to the OAB-V8 questionnaire (score  $\geq 8$  points) was similar in men and women (25%

and 24%, respectively,  $P =$  non-significant; Supplementary Table S1). However, among those with OAB, approximately one-third of the men versus approximately two-thirds of the women had wet OAB (ie, UUI occurring less than half the time or more).

In men, there was a non-significant tendency for OAB prevalence to increase with increasing age ( $P = 0.095$ ; OAB prevalence was 19.5% among men aged  $\leq 49$  years and 27.8% among those aged  $\geq 70$  years). Conversely, a non-significant trend towards decreasing prevalence with increasing age was observed in women ( $P = 0.065$ ; OAB prevalence rates of 27.1% [age  $\leq 49$  years] and 21.6% [age  $\geq 70$  years]).

As shown in Supplementary Table S1, UI was considerably more common in women than men (definition 1: 45.5% vs 14.7%,  $P < 0.001$ ). SUI was also present in a higher percentage of women than men (definition 1: 20.4% vs 2.6%,  $P < 0.001$ ). SUI was the most common type of UI in women, while in men UUI was most common (definition 1 prevalence: 9.4%).

According to the IPSS questionnaire, the prevalence and severity of symptoms were similar in men and women ( $P = 0.432$ ; Supplementary Table S2). Moderate-to-severe symptoms were present in 20.8% of men and 23.9% of women.

**TABLE 2** Prevalence of specific symptoms according to definition 1 (symptoms occurring less than half the time or more) and definition 2 (symptoms occurring about half the time or more) and associated bother in men and women

|  | Men (n = 2433)                                 |  |  | Women (n = 2751)                               |  |  |     |      |     |      |
|--|--|--|--|--|--|--|-----|------|-----|------|
|  | Symptom prevalence [definition 1] <sup>a</sup> | Symptom prevalence [definition 2] <sup>a</sup> | Prevalence of bother [at least quite a bit] <sup>a,b</sup> | Symptom prevalence [definition 1] <sup>a</sup> | Symptom prevalence [definition 2] <sup>a</sup> | Prevalence of bother [at least quite a bit] <sup>a,b</sup> |     |      |     |      |
|  | n  | %  | n  | %  | n  | %  |     |      |     |      |
| <b>Voiding symptoms</b>                  |  |  |  |  |  |  |     |      |     |      |
| Slow stream                              | 460  | 18.9   | 228  | 9.4  | 437  | 15.9   | 206 | 7.5  | 96  | 46.6 |
| Splitting                                | 422  | 17.4*  | 194  | 8.0  | 376  | 13.7   | 192 | 7.0  | 104 | 54.4 |
| Intermittency                            | 322  | 13.3   | 159  | 6.5  | 412  | 15.0   | 200 | 7.3  | 99  | 49.7 |
| Hesitancy                                | 329  | 13.5**   | 138  | 5.7  | 253  | 9.2  | 114 | 4.2  | 49  | 42.8 |
| Straining                                | 157  | 6.4*   | 65   | 2.7  | 113  | 4.1  | 59  | 2.2  | 33  | 56.3 |
| Terminal dribble                         | 614  | 25.2***  | 312  | 12.8**   | 487  | 17.7   | 237 | 8.6  | 102 | 43.0 |
| <b>Storage symptoms</b>                  |  |  |  |  |  |  |     |      |     |      |
| Perceived frequency                      | 673  | 27.7*  | 397  | 16.3*  | 888  | 32.3   | 556 | 20.2 | 217 | 39.0 |
| Nocturia ≥2 episodes                     | 659  | 27.1*  | 287  | 11.8*  | 891  | 32.4   | 413 | 15.0 | 169 | 41.0 |
| Urgency                                  | 455  | 18.7*  | 170  | 7.0***   | 647  | 23.5   | 324 | 11.8 | 238 | 73.6 |
| Urgency with fear of leaking             | 356  | 14.6***  | 129  | 5.3***   | 603  | 21.9   | 309 | 11.2 | 218 | 70.6 |
| Urgency urinary incontinence             | 228  | 9.4***   | 100  | 4.1***   | 409  | 14.9   | 214 | 7.8  | 160 | 74.5 |
| Stress urinary incontinence              | 63   | 2.6***   | 24   | 1.0***   | 562  | 20.4   | 268 | 9.7  | 204 | 76.2 |
| Leak for no reason                       | 95   | 3.9***   | 51   | 2.1**  | 284  | 10.3%  | 134 | 4.9  | 106 | 79.2 |
| Nocturnal enuresis                       | 38   | 1.6**  | 18   | 0.7*   | 95   | 3.5  | 52  | 1.9  | 40  | 78.0 |
| Leak during sexual activity <sup>c</sup> | 22   | 1.1*   | 10   | 0.5  | 32   | 2.5  | 14  | 1.1  | 10  | 73.3 |
| <b>Post-micturition symptoms</b>         |  |  |  |  |  |  |     |      |     |      |
| Incomplete emptying                      | 306  | 12.6   | 150  | 6.2  | 381  | 13.8   | 190 | 6.9  | 128 | 67.4 |
| Post-micturition dribble                 | 418  | 17.2***  | 158  | 6.5  | 330  | 12.0   | 165 | 6.0  | 128 | 77.4 |

<sup>a</sup>Weighted values (subgroups may not equal total n because of rounding, weighted values or missing data).

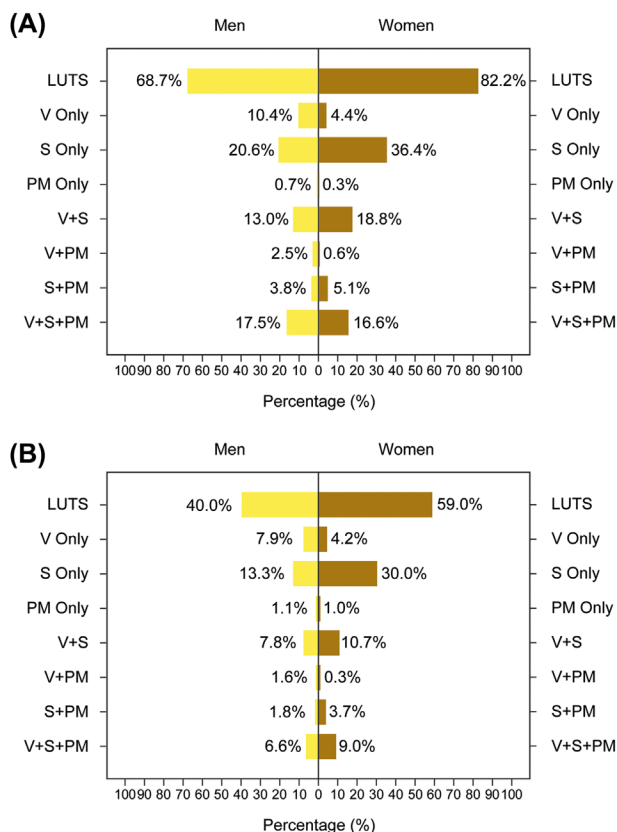
<sup>b</sup>Based on definition 2.

<sup>c</sup>1871 cases with no sexual activity in the past 6 months and 33 cases with missing information.

\* $P \leq 0.05$ , men vs women.

\*\* $P \leq 0.01$ , men vs women.

\*\*\* $P \leq 0.001$ , men vs women.



**FIGURE 2** LUTS subtypes (voiding, storage, post-micturition, and combinations) in men and in women according to the two study definitions: definition 1 (symptoms occurring less than half the time or more; (A) and definition 2 (symptoms occurring about half the time or more; (B). LUTS, lower urinary tract symptoms; PM, post-micturition symptoms; S, storage symptoms; V, voiding symptoms

### 3.3 | Quality of life

IPSS quality of life data showed that, among individuals with LUTS less than half the time or more, 39.5% (men: 35.6%, women: 42.9%;  $P = 0.001$ ) would be “mostly dissatisfied,” “unhappy,” or consider it “terrible” to spend the rest of their life with their urinary condition as it is currently. Corresponding data for individuals with LUTS occurring half the time or more were 48.1% (men: 42.5%, women: 52.6%;  $P = 0.007$ ).

## 4 | DISCUSSION

This cross-sectional study, performed across major cities representing all five geographical regions of Brazil, is the first robust population-based epidemiological study of LUTS in Brazil. Significantly more women than men were affected by LUTS, with symptoms occurring less than half the time or more in 69% of men and 82% of women and symptoms occurring half the time or more affecting 40% of men and 59% of women. IPSS-defined LUTS with at least moderate

symptom severity was reported by 22.5% of participants. Symptoms were commonly bothersome: for most symptoms, over half of affected individuals rated bother as at least quite a bit. Storage symptoms represented the most common ICS category in both men and women, although these symptoms tended to be more common in women than in men. Co-existence of multiple symptoms was common: with definition 1, larger numbers of men and women had multiple symptom subtypes than voiding, storage or post-micturition symptoms only.

International studies have estimated the prevalence of LUTS, according to ICS criteria, to be around 45% (adults aged  $\geq 20$  years),<sup>12</sup> 65% (adults aged  $\geq 40$  years),<sup>3</sup> and 74% (adults aged  $> 40$  years).<sup>2</sup> In a population-based survey, conducted by Chapple et al. in adults aged  $\geq 40$  years in China, South Korea and Taiwan, LUTS prevalence according to ICS criteria was 61%.<sup>13</sup> Our observation of LUTS in 75% of adults aged  $\geq 40$ , with more women than men affected (82% vs 69%) suggests similar LUTS prevalence in Brazil compared with other countries. However, the difference between the sexes in our study was larger than in the international studies (eg, prevalence rates of 76% and 72% in women and men, respectively, in the EpiLUTS study<sup>2</sup>).

Of the three ICS-defined categories of LUTS (voiding, storage, and post-micturition), storage symptoms represented the most prevalent category in both men and women in our study. Male LUTS, particularly voiding symptoms, are often attributed to the prostate and a supposed bladder outlet obstruction.<sup>14,15</sup> Our findings indicate that voiding symptoms are not the only LUTS in men, suggesting the existence of additional causes. In women, storage symptoms are generally considered as the most common category,<sup>4</sup> but we observed at least one voiding symptom in more than one-third of women. Therefore, it appears that there is no single, dominant cause of LUTS in either men or women.

Our results are in accordance with other epidemiological studies, corroborating the current concept of LUTS not being dependent on a single disease or sex.<sup>14</sup> A similar pattern of ICS symptom category frequencies was observed in the EPIC study, which used the same method as the current study for assessing LUTS prevalence.<sup>3</sup> ICS symptom categories were also assessed in the EpiLUTS study, in which 66% of men and 61% of women with LUTS had symptoms from multiple categories.<sup>16</sup> In both sexes, storage symptoms were reported in 46% and 67%, respectively, voiding symptoms were present in 57% and 48%, respectively while post-micturition symptoms (which occurred mainly in association with storage or voiding symptoms) were reported in 40% and 32.5%, respectively. In patients with multiple, co-existent LUTS categories, a single cause cannot be pinpointed and a broad, symptom-driven approach is likely to be needed for effective treatment.<sup>17</sup>

**TABLE 3** Correlation between frequency of symptoms and bother intensity

|  | Sex                                 |                                       |
|--|-------------------------------------|---------------------------------------|
|  | Men ( <i>n</i> = 2433) <sup>a</sup> | Women ( <i>n</i> = 2751) <sup>a</sup> |
|  | <i>r</i> <sup>S*</sup>              | <i>r</i> <sup>S*</sup>                |
| Voiding symptoms                         |                                     |                                       |
| Slow stream                              | 0.643                               | 0.748                                 |
| Splitting                                | 0.615                               | 0.751                                 |
| Intermittency                            | 0.648                               | 0.717                                 |
| Hesitancy                                | 0.724                               | 0.764                                 |
| Straining                                | 0.789                               | 0.917                                 |
| Terminal dribble                         | 0.623                               | 0.711                                 |
| Storage symptoms                         |                                     |                                       |
| Perceived frequency                      | 0.576                               | 0.652                                 |
| Nocturia ≥1                              | 0.504                               | 0.543                                 |
| Urgency                                  | 0.750                               | 0.820                                 |
| Urgency with fear of leaking             | 0.752                               | 0.806                                 |
| Urgency urinary incontinence             | 0.830                               | 0.881                                 |
| Stress urinary incontinence              | 0.820                               | 0.871                                 |
| Leak for no reason                       | 0.839                               | 0.910                                 |
| Nocturnal enuresis                       | 0.901                               | 0.938                                 |
| Leak during sexual activity <sup>a</sup> | 0.734                               | 0.984                                 |
| Post-micturition symptoms                |                                     |                                       |
| Incomplete emptying                      | 0.801                               | 0.862                                 |
| Post-micturition dribble                 | 0.771                               | 0.898                                 |

*r*<sup>S</sup> Spearman correlation (from -1, perfect negative correlation to +1, perfect positive correlation).

<sup>a</sup>*n* = 2033 (men) and 1280 (women) for leak during sexual activity.

\**P* < 0.001 for all correlations.

We found similar OAB prevalence between the sexes (25% in men and 24% in women). However, among those with OAB, approximately one-third of the men versus two-thirds of the women had wet OAB. Correspondingly, urgency-related symptoms were more common in women than in men. A previous Brazilian study of OAB was performed in Porto Alegre among individuals aged 15-55 years. Using the King's Health Questionnaire (validated for OAB) the prevalence of OAB was reported as 19%.<sup>8</sup> In a study of adults aged ≥30 years in Salvador, Brazil, OAB prevalence was also lower than in our study (5.1% in men and 10% in women).<sup>4</sup> Frequency and severity of urgency were used to define OAB, whereas our study used the OAB-V8 questionnaire, which has demonstrated high sensitivity and specificity in identifying OAB.<sup>10</sup> In international studies, OAB has been estimated to affect 11% of men and 13% of women aged ≥18 years,<sup>3</sup> and to occur at least sometimes in 22-24% of men and 41-42% of women aged ≥40 years.<sup>7</sup> The Asian population-based study showed that 21% of adults aged ≥40 years have OAB,<sup>18</sup> and the US National Overactive Bladder Evaluation (NOBLE) study reported that OAB affects 16.5% of adults

aged >18 years.<sup>19</sup> Considering differences in study populations and methods of measuring OAB, overall OAB prevalence rate in the current study appears consistent with both international studies and other Brazilian studies.

In the present study, there was no significant association between OAB prevalence and age, similar to findings reported in a study performed in Porto Alegre.<sup>8</sup> However, international studies indicate that OAB prevalence increases with increasing age in both men and women.<sup>20</sup>

The IPSS is used globally and can be used for comparing LUTS prevalence across studies. In the Asian study, 39.8% and 43.2% of individuals aged 55-60 and >60 years, respectively, had an IPSS score ≥8.<sup>13</sup> In adults aged >50 years in Denmark, LUTS prevalence has been estimated by this measure as 28% in men and 20% in women,<sup>21</sup> while prevalence rates ranging between 28% and 72% were reported in men aged 40-79 years in Boxmeer (the Netherlands), Auxerre (France), Birmingham (UK), and Seoul (Republic of Korea).<sup>22</sup> The prevalence in UK men aged >50 years has been reported as 41%,<sup>23</sup> and in Singapore the rate among men aged ≥40 was estimated to be 16.5%.<sup>24</sup> Despite the variability in

these data, the prevalence rates we observed in adults aged  $\geq 40$  years (men, 21%; women, 24%) suggest broadly consistent rates of IPSS-defined LUTS in Brazil as in other countries. Interestingly, differences between the sexes in the prevalence of IPSS-defined LUTS were much smaller than with ICS-defined LUTS. Different questionnaires (eg, IPSS, ICS definitions) ask about LUTS in different ways and provide different response option formats. Respondent interpretations of the questions and response options might result in inconsistencies between studies, and translations into different languages can increase variability. The IPSS is the most used questionnaire for LUTS assessment, but it is limited by the inclusion of only seven questions, and the assessment of storage LUTS is particularly restricted. Moreover, the IPSS was developed prior to the development of the OAB concept.

Storage symptoms have previously been acknowledged as the most bothersome LUTS. In the population-based study in China, Taiwan, and South Korea, two out of the three symptoms causing most patients to have “quite a bit or greater” bother were related to storage (nocturia and urgency).<sup>13</sup> Symptoms most commonly reported as bothersome in the EpiLUTS study included leaking urine during sexual activity, urgency with fear of leaking, SUI associated with physical activities, leaking for no reason, and nocturnal enuresis.<sup>2</sup> In accordance with these data, storage-related symptoms showed greatest bother in this study.

We found statistically strong associations between the frequency and bother of each symptom, and the highest correlation coefficients were observed with symptoms of incontinence. Thus, the more frequent the occurrence of UI (including urgency incontinence, SUI, post-micturition dribble, leakage during sexual activity, leakage for no reason, and nocturnal enuresis) the more severe the bother. Similar correlations between symptoms and bother have been reported previously.<sup>2</sup>

Strengths of this study include the large sample size and the inclusion of all five geographical regions of Brazil, which have diverse climatic conditions and cultures. In addition, our study included balanced numbers of men and women. A wide variety of questions were included in the survey, and well-established, validated diagnostic tools were employed. As with all studies of this nature, limitations included self-reporting of LUTS without medical evaluation, reliance upon telephone interviews during which individuals may not always provide accurate answers, and possible selection bias because of the requirement for telephone contact. Many areas of Brazil—including all rural areas—were not included. Rural populations would have been more difficult to reach, and their exclusion should have had little impact on the results as LUTS prevalence has been reported to be similar in rural and urban populations.<sup>25</sup>

## 5 | CONCLUSIONS

This was the first nationwide, population-based epidemiological study of LUTS to be performed in Brazil. LUTS are highly prevalent and often bothersome among men and women aged  $\geq 40$  years. Women are more likely to be affected than men, a finding which appears magnified in Brazil compared with other countries. Specific symptoms and categories of symptoms were not sex-specific, and there was a significant level of symptom overlap. Comprehensive assessment of LUTS and their effects may help ensure appropriate diagnosis and treatment in the general population.

## ACKNOWLEDGMENTS

The authors would like to thank the participants of the study for their time. This study was funded by Astellas Farma Brasil. Editorial support, including writing assistance, was provided by Ken Sutor BSc and Jackie van Bueren BSc of Envision Scientific Solutions, funded by Astellas Pharma Global Development.

## ORCID

Marcio Augusto Averbek  <http://orcid.org/0000-0002-8127-7153>

## REFERENCES

- Abrams P, Cardozo L, Fall M, et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourol Urodyn*. 2002;21:167–178.
- Coyne KS, Sexton CC, Thompson CL, et al. The prevalence of lower urinary tract symptoms (LUTS) in the USA, the UK and Sweden: results from the Epidemiology of LUTS (EpiLUTS) study. *BJU Int*. 2009;104:352–360.
- Irwin DE, Milsom I, Hunskaar 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;50:1306–1314.
- Moreira ED, Jr., Neves RC, Neto AF, et al. A population-based survey of lower urinary tract symptoms (LUTS) and symptom-specific bother: results from the Brazilian LUTS epidemiology study (BLUES). *World J Urol*. 2013;31:1451–1458.
- de Souza Santos CR, Santos VL. Prevalence of urinary incontinence in a random sample of the urban population of Pouso Alegre, Minas Gerais, Brazil. *Rev Lat Am Enfermagem*. 2010;18:903–910.
- Jesus Menezes MA, Hashimoto SY, de Gouveia Santos VL. Prevalence of urinary incontinence in a community sample from the city of Sao Paulo. *J Wound Ostomy Continence Nurs*. 2009;36:436–440.
- Coyne KS, Sexton CC, Kopp ZS, et al. The impact of overactive bladder on mental health, work productivity and health-related



- quality of life in the UK and Sweden: results from EpiLUTS. *BJU Int.* 2011;108:1459–1471.
8. Teloken C, Caraver F, Weber FA, et al. Overactive bladder: prevalence and implications in Brazil. *Eur Urol.* 2006;49:1087–1092.
  9. Barry MJ, Fowler FJ, Jr., O'Leary MP, et al. The American Urological Association symptom index for benign prostatic hyperplasia. the Measurement Committee of the American Urological Association. *J Urol.* 1992;148:1549–1557.
  10. Coyne KS, Zyczynski T, Margolis MK, et al. Validation of an overactive bladder awareness tool for use in primary care settings. *Adv Ther.* 2005;22:381–394.
  11. Llorente C. New concepts in epidemiology of lower urinary tract symptoms in men. *Eur Urol Suppl.* 2010;9:477–481.
  12. Irwin DE, Kopp ZS, Agatep B, et al. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. *BJU Int.* 2011;108:1132–1138.
  13. Chapple C, Castro-Diaz D, Chuang Y-C, et al. Prevalence of LUTS in China, Taiwan and South Korea (LUTS Asia): results from a cross-sectional, population-based study. *Adv Ther.* 2017; <https://doi.org/10.1007/s12325-12017-10577-12329>. Article Online First.
  14. Chapple CR, Roehrborn CG. A shifted paradigm for the further understanding, evaluation, and treatment of lower urinary tract symptoms in men: focus on the bladder. *Eur Urol.* 2006;49:651–658.
  15. Kahokehr AA, Gilling PJ. Recent advances in the understanding of male lower urinary tract symptoms (LUTS). *F1000Res.* 2016;5.
  16. Sexton CC, Coyne KS, Kopp ZS, et al. The overlap of storage, voiding and postmicturition symptoms and implications for treatment seeking in the USA, UK and Sweden: epiLUTS. *BJU Int.* 2009;103:12–23.
  17. Blanker MH, Norg RJ, van der Heide WK. A new approach to patients with lower urinary tract symptoms. *Br J Gen Pract.* 2012;62:344–345.
  18. Chuang YC, Liu SP, Lee KS, et al. Prevalence of overactive bladder in China, Taiwan and South Korea: results from a cross-sectional, population-based study. *Low Urin Tract Symptoms.* 2017. <https://doi.org/10.1111/luts.12193>
  19. Stewart WF, Van Rooyen JB, Cundiff GW, et al. Prevalence and burden of overactive bladder in the United States. *World J Urol.* 2003;20:327–336.
  20. Eapen RS, Radomski SB. Review of the epidemiology of overactive bladder. *Res Rep Urol.* 2016;8:71–76.
  21. Norby B, Nordling J, Mortensen S. Lower urinary tract symptoms in the Danish population: a population-based study of symptom prevalence, health-care seeking behavior and prevalence of treatment in elderly males and females. *Eur Urol.* 2005;47:817–823.
  22. Boyle P, Robertson C, Mazzetta C, et al. The prevalence of lower urinary tract symptoms in men and women in four centres. The UrEpiK study. *BJU Int.* 2003;92:409–414.
  23. Trueman P, Hood SC, Nayak US, et al. 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;83:410–415.
  24. Chong C, Fong L, Lai R, et al. The prevalence of lower urinary tract symptoms and treatment-seeking behaviour in males over 40 years in Singapore: a community-based study. *Prostate Cancer Prostatic Dis.* 2012;15:273–277.
  25. Egan KB, Suh M, Rosen RC, et al. Rural vs. urban disparities in association with lower urinary tract symptoms and benign prostatic hyperplasia in ageing men, NHANES 2001–2008. *Int J Clin Pract.* 2015;69:1316–1325.

## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

**How to cite this article:** Soler R, Gomes CM, Averbek MA, Koyama M. The prevalence of lower urinary tract symptoms (LUTS) in Brazil: Results from the epidemiology of LUTS (Brazil LUTS) study. *Neurourology and Urodynamics.* 2018;37:1356–1364. <https://doi.org/10.1002/nau.23446>