

# The correlation between lower urinary tract symptoms (LUTS) and erectile dysfunction (ED): results from a survey in males from Mexico City (MexiLUTS)

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## Abstract

**Introduction** ED and LUTS affect a high proportion of male population. Although Hispanics are suspected to have a higher risk of experiencing LUTS, detailed information on its frequency and association with ED in this population is scarce.

**Objective** To determine the frequency of LUTS and ED, and its correlation in Mexican males.

**Methods** A cross-sectional analytical survey was answered by 1041 men. It included the International Prostate Symptom Score and the quality of life question (IPSS/QoL); International Index of Erectile Function (IIEF-5); the short form of the International Consultation of Incontinence Questionnaire (ICIQ-SF); and demographic data. For the analysis, we divided our population into 2 groups (18–39 and 40 and older), and then an exploratory correlation analysis was performed to search for significant differences among IPSS severity groups, and finally a multivariate regression model was applied.

**Results** Mean age was  $48.6 \pm 14.5$  years. One hundred twenty-three individuals (11.8 %) were asymptomatic, and 611 (58.7 %) had mild, 226 (21.7 %) had moderate, and 81 (7.8 %) had severe IPSS score. The most common

symptoms were nocturia (72.4 %), increased urinary frequency (58.3 %), and slow urinary stream (42.6 %). Two hundred fifty-eight (24.7 %) complained of incontinence. Of 765 individuals, 484 (63.2 %) reported some degree of ED. Severe LUTS, DM, and age were independent risk factors for ED severity.

**Conclusion** LUTS and ED may represent one of the largest sources of morbidity in our population, and their association was demonstrated. Awareness on these entities should be raised, and further research is required to determine the higher frequency of LUTS and ED in Hispanics.

**Keywords** Lower urinary tract symptoms · Erectile dysfunction · Urinary incontinence · Hispanic · Latin America

## Introduction

According to the International Continence Society (ICS), the term lower urinary tract symptoms (LUTS) refers to a variety of symptoms affecting the urinary bladder, prostate, and/or urethra, classified into voiding, storage, and post-micturition symptoms [1].

It is estimated that LUTS affect 2.1 billion people worldwide [2] and, according to the EpiLUTS study, up to 72.3 % of adult men have experienced at least 1 LUTS [3]. Moreover, their frequency and deleterious impact on quality of life (QoL) make LUTS one of the most common reasons for urological consultation [2, 3]. On the other hand, it was estimated that erectile dysfunction (ED) affected more than 125 million men worldwide in the 1990s [4] and the frequency ranges from 9.7 to 33.8 % in Mexican reports [5, 6]. These two entities have a direct correlation with

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Benjamin Gonzalez-Sanchez and Jesus Cendejas-Gomez have contributed equally to this work.

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age, and current evidence suggests a possible association between them [7, 8].

The majority of cohorts of patients with LUTS are comprised of individuals of European ancestry living in high-income countries, and few are based in Latin America. Furthermore, the inclusion of Hispanic participants within US-based cohorts is low. Gaps in cohort coverage result in the troublesome omission of populations with different lifestyle profiles and exclusion of specific ancestry groups, both of which may be highly informative for furthering our understanding of LUTS. Recently, the California Men's Health Study (CMHS), comprising 13.5 % of Hispanic population, showed that this subgroup was at higher risk of having moderate and severe LUTS [9, 10]. However, detailed information on the frequency of LUTS and its association with ED in Hispanics is critically lacking. This study has the potential to provide relevant information to understand the impact of these two disorders among Mexican men who also represent one of the largest immigrant groups in the USA.

Finding an association between LUTS and ED has been the aim of numerous studies. Recently, Hartung and colleagues conducted a multinational cross-sectional study showing that patients with severe LUTS had an OR = 2.0 (95 % CI 1.4, 2.8) of suffering from ED [11]. Nevertheless, to our knowledge, the information from Mexican population is scarce.

The main purpose of our study was to determine the frequency of LUTS and ED in Mexican males and also to demonstrate an association between them.

## Methods

This study, approved by our Institutional Ethics and Research Committee (Ref. 925), was conducted between February 2014 and January 2015. It consisted in a survey answered by 1041 men aged 18 or older who willingly answered the questionnaires in an anonymous fashion by any of the following means.

Printed on-site questionnaire: Within our institutional facilities, any men not seen regularly as patients of the urology department that were in the ambulatory patient waiting room between 9 and 12 h were invited to participate. The evaluation included the Spanish validated version of: (1) International Prostate Symptom Score (IPSS) with the quality of life (QoL) question. Accordingly, LUTS were classified as mild (1–7), moderate (8–19) and severe (20–35), and QoL from 0 to 5 [12, 13]; additionally, we also asked for the most bothersome urinary symptom and the number of episodes of nocturia per night; (2) International Index of Erectile Function (IIEF-5) which stratifies ED as normal (22–25), mild (17–21), mild to moderate (12–16),

moderate (8–11), and severe (5–7) [14]; and (3) The short form of the International Consultation of Incontinence Questionnaire (ICIQ-SF) used to assess the presence (with score of 1) and severity of incontinence [15]. Comorbidities were registered by patient self-recall without any diagnostic maneuvers. In addition, demographic data, smoking habit, and beverage consumption type were also asked, for a total of 32 questions (Appendix 1 of Supplementary Material).

Online survey: By logging in into our institutional Web site, men could access the online version of the questionnaires by clicking on the banner advertising the survey, and then participants were redirected to the following URL address: <https://es.surveymonkey.com/r/encuestaurologia>. The online survey only included the IPSS and the ICIQ-SF.

The same inclusion criteria were applied in the online and on-site version of the questionnaires to include the participants into the analysis.

LUTS were also classified according to the ICS definitions [1] as increased frequency, nocturia, urgency, urinary incontinence (UI), urgency urinary incontinence (UUI), mixed urinary incontinence (MUI), incomplete voiding, hesitancy, straining, terminal dribble, and slow stream. Bothersome symptoms were defined when having a score of 2 or higher in the IPSS/QoL question.

The statistical analysis was performed in 3 steps: First, searching for potential correlations between variables, an exploratory analysis including IPSS severity, IIEF score, medical history, and demographic data was performed. Second, after selecting potential variables, we used the Kruskal–Wallis test to determine the characteristics with significant differences among IPSS severity groups. Third, a multivariate regression model was performed using significant variables to find an association between the independent and dependent variables. This process was completed using IBM SPSS® version 20 software. Statistical significance was stated as  $p < .05$ .

Finally, after dividing our population in 2 groups by age (39 or less and 40 and older), we carried out an additional analysis to identify risk factors between a young and an older population.

## Results

A total of 299 online questionnaires were answered, of these 118 were excluded: 45 were answered by women and 73 were incomplete, leaving 172 suitable for analysis (16.5 %). On the other hand, 1030 patients answered the printed questionnaire, of these 161 were incomplete, leaving 869 (83.5 %) for analysis. Thus, the final number of participants was 1041. Clinical and demographic characteristics are described in Table 1.

**Table 1** Demographic characteristics and comorbidities

No. of participants	1041	100.0 %
Demographics		
Mean age	48.6	±14.5
Range	18	90
Education		
None	14	1.3 %
Elementary	245	23.5 %
High school	221	21.2 %
Professional	425	40.8 %
Postgraduate	136	13.1 %
Residence		
Mexico City and metropolitan area	740	71.1 %
Morelos State	23	2.2 %
Hidalgo State	32	3.1 %
Other states	166	15.9 %
Refused to answer	80	7.68 %
Coffee consumption		
Yes	682	No
		359
Smoking habit		
Yes	244	No
		797
Reported comorbidities		
Diabetes	120	11.5 %
Hypertension	112	10.8 %
Other comorbidities*	113	10.9 %
Chronic obstructive pulmonary disease	3	.3 %
Chronic kidney disease	5	.5 %
Reported medications		
5-Alpha-reductase inhibitors	5	.5 %
Alpha-blocker therapy	14	1.3 %
Diuretics	6	.6 %
Phytotherapy	1	.1 %
NON-diuretic antihypertensives	3	.3 %
Phosphodiesterase-5 inhibitors	1	.1 %
Previous urological procedures		
Prostatectomy	7	.7 %
Transurethral resection of the prostate	8	.8 %
Ureteroscopy	10	1.0 %
Urethroplasty	3	.3 %
Urological assessment for current symptoms		
Yes	152	14.60 %
No	889	85.40 %

\* Includes HIV, rheumatologic, gastroenterologic, etc.

**IPSS**

A total of 123 individuals (11.8 %) were asymptomatic (IPSS 0), while 611 (58.7 %) had mild, 226 (21.7 %) moderate, and 81 (7.8 %) severe IPSS. Our cohort included 929 (89.2 %) men with at least one urinary symptom (including

**Table 2** Multivariate analysis to identify independent risk factors

IPSS severity	HR	CC		p value
		Lower limit	Upper limit	
<b>Mild</b>				
Age	1.017	1.000	1.034	.056
IIEF severity	1.099	.885	1.363	.393
<b>Diabetes</b>	<b>5.790</b>	<b>1.377</b>	<b>24.356</b>	<b>.017</b>
Urologic procedures	1.114	.413	3.002	.831
Coffee consumption	1.012	.643	1.594	.957
<b>Moderate</b>				
<b>Age</b>	<b>1.040</b>	<b>1.020</b>	<b>1.061</b>	<b>≤.0001</b>
IIEF severity	1.229	.963	1.568	.097
<b>Diabetes</b>	<b>5.151</b>	<b>1.164</b>	<b>22.800</b>	<b>.031</b>
Urologic procedures	1.833	.636	5.284	.262
Coffee consumption*	1.047	.613	1.786	.867
<b>Severe</b>				
<b>Age</b>	<b>1.047</b>	<b>1.018</b>	<b>1.076</b>	<b>.001</b>
<b>IIEF severity</b>	<b>1.630</b>	<b>1.205</b>	<b>2.206</b>	<b>.002</b>
<b>Diabetes</b>	<b>7.506</b>	<b>1.557</b>	<b>36.177</b>	<b>.012</b>
Urologic procedures	1.396	.362	5.382	.628
Coffee consumption	1.129	.544	2.344	.745

Bold values indicate statistically significant results

incontinence); moreover, 352 (33.8 %) had clinically relevant symptoms (IPSS ≥ 7). The most common symptoms were nocturia (72.4 %), increased urinary frequency (58.3 %), and slow urinary stream (42.6 %). LUTS were considered bothersome by 508 men (48.8 %).

**IIEF**

Data of 765 men were analyzed. Of those patients, 484 (63.2 %) reported some degree of ED, 232 (30.3 %) had mild ED, 131 (17.1 %) had mild to moderate ED, 75 (9.8 %) had moderate ED, and 46 (6 %) had severe ED.

**ICIQ**

A total of 1041 patients correctly answered this questionnaire, of which 258 (24.7 %) complained of incontinence.

**Association between LUTS and ED**

For the ED–LUTS correlation analysis, 765 on-site questionnaires having the 3 evaluation formats fully answered (IPSS, ICIQ-SF, and IIEF-5) were considered. Of those with mild (456 men), moderate (158 men), and severe (52 men) LUTS, 278 (61 %), 118 (75 %), and 44 (85 %) reported some degree of ED, respectively.

## Group comparison

A comparison among IPSS severity groups was performed showing a significant difference in age ( $p < .001$ ), IIEF severity ( $p < .0001$ ), DM ( $p = .001$ ), and history of urinary procedures ( $p = .004$ ).

## Multivariate analysis

Severity of LUTS according to IPSS was analyzed. DM remained as an independent factor associated with mild symptoms, while moderate symptoms were associated with age and DM. Severe symptoms were associated with ED, age, and DM (Table 2).

## Discussion

Our findings provide further insight into the frequency of LUTS and ED and their association in Mexican males. Interestingly, despite being a young cohort (mean age 48 years), only 10.8 % were free from LUTS, 36.8 % reported normal erectile function, and 75.3 % had complete continence. These data will potentially have an impact beyond our borders, since, according to OECD [16], Mexico is the first among the 16 countries that encompass half the world's migration phenomenon.

Eighty-eight percent of our population (918 male subjects) reported at least one symptom in the IPSS questionnaire. This frequency is slightly higher to that reported in EpiLUTS (71.02 %) [3, 17] and BLUES studies (81.5 %) [18]. This could be explained by the higher risk of suffering moderate and severe LUTS in Hispanics, as recently described [9, 10]. Potential causes may be related to organic, environmental, lifestyle, or cultural factors.

Nocturia was the most frequent symptom in our cohort. Defining nocturia as 2 or more episodes per night, we expected a reduction of at least 15–20 % in the frequency of LUTS as described in other series [3, 17, 18]. However, we only found a 9.6 % reduction showing that other symptoms modify this figure. Although nocturia was reported by 27.5 %, it was considered bothersome by 43.8 %.

The frequency of ED in our study (63.2 %) was higher than that previously reported in our country (9.7–33.8 %) [5, 6]. This could be explained by comorbidities in our cohort.

Common risk factors associated with LUTS are age, metabolic syndrome, cardiovascular disease, and hyperlipidemia [19]. As shown in the group comparison, age and ED were statistically different among LUTS severity groups and ED remained as independent risk factor for LUTS. The association between LUTS and ED could be explained by common pathophysiological mechanisms [20–22]. Age

also correlated with the severity of LUTS except in mild IPSS group, while DM was significantly associated with mild and moderate IPSS. These findings are similar to previous reports [3, 17, 18, 23, 24]. The high prevalence of DM in Hispanics [25] could make this condition one of the major contributors to the frequency of LUTS in our population.

An additional analysis using the three-step model was performed to search for differential and shared risk factors for LUTS between participants aged 18–39 and those older than 40. Severe ED was an independent risk factor for severe LUTS in both groups, suggesting a common pathophysiological mechanism. However, further investigations are necessary to confirm these findings. Urinary procedures were a significant risk factor in the group aged 18–39, whereas age and DM were independent predictors in the group 40 years or older regardless of LUTS severity (Appendix 2 of Supplementary Material).

Surprisingly, few participants sought for urological attention (14.6 %), despite the high frequency and bother due to LUTS. Considering the educational level in our cohort (75.1 % had at least high school), we believe this finding reflects the need for more preventive strategies and delivery of health information to our population.

We acknowledge the limitations of our study. First, we used questionnaires without other diagnostic tools. Nevertheless, we used the validated Spanish versions of IPSS, IIEF, and ICIQ-SF to ameliorate interpretative differences among individuals. Second, this information mostly arises from Mexico City inhabitants (more than 70 % of our population came from metropolitan area of Mexico City), thus excluding a great number of individuals from other regions and selecting those with higher educational level. Third, due to printed questionnaire method, the number of participants was limited. Despite these drawbacks, this study provides useful information about LUTS and ED in Mexican males living in Mexico City as well as its associations. Although generalization of these results to other Latin American males is difficult, the information provided from this research suggests an increased frequency of LUTS in association with ED. Finally, in our country, population-based data derived from healthcare institutions sponsored by government are scarce or absent. Thus, the information obtained from surveys or case–control studies is a useful resource for improving the understanding of the clinical relevance of LUTS and ED.

## Conclusion

In conclusion, LUTS in males from Mexico City are frequent. Regardless of age, higher severity of ED is associated with severe LUTS, suggesting an etiological pathway

in common for both. It is of critical relevance to raise awareness of these two entities to determine common etiological factors.

**Author contribution** B. Gonzalez-Sanchez and J. Cendejas-Gomez involved in project development, data collection, data analysis, and manuscript writing; J.A. Rivera-Ramirez contributed to data collection, data analysis, and manuscript writing; J.O. Herrera-Caceres involved in data analysis and manuscript writing; D. Olvera-Posada contributed to project development and data collection; C.I. Villeda-Sandoval contributed to project development, data analysis, and manuscript writing; R.A. Castillejos-Molina, G. Feria-Bernal, and A. Garcia-Mora are advisors; F. Rodriguez-Covarrubias involved in project development, data analysis, manuscript writing and supervision.

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