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Potential associations of adult nocturia. Results from a national prevalence study

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Abstract

Aim: To determine the prevalence of nocturia and associated risk factors in the Colombian population aged ≥18 years old.

Methods: This is a cross-sectional population-based study conducted in 1060 participants in Colombia. Nocturia was assessed with the Spanish version of the ICIQ-OAB, using the ICS terminology. Descriptive statistics were used to evaluate nocturia prevalence. Logistic regression analysis was carried out to determine the association of nocturia with predefined variables.

Results: The prevalence of nocturia was 55.9% and it was more common in women than men (53.96% vs. 46.04%; $p = .004$). At least three episodes of nocturia were observed in 20.37% of the participants who had a severe alteration in their quality of life ($p < .01$). The bivariate model showed an association between nocturia and obesity (odds ratio [OR], 1.69; 90% confidence interval [CI]: 1.22–2.34), diabetes mellitus (OR, 2.99; 90% CI: 1.86–4.83), high blood pressure (OR, 2.04; 90% CI: 1.52–2.72), cardiovascular disease (OR, 1.75; 90% CI: 1.08 – 2.83), depression (OR, 1.89; 90% CI: 1.23–2.89), obstructive sleep apnea (OR, 1.70; 90% CI: 1.17 - 2.46), and childhood enuresis (OR, 1.45; 90% CI: 1.04–2.02). The multivariate model showed an association with obesity (OR, 2.0; 95% CI: 1.14 - 3.51) in women, as well as age ≥ 65 years (OR, 3.18; 95% CI: 1.26 – 8.02) and erectile dysfunction (OR, 3.44; 95% CI: 1.21 – 9.72) in men. Childhood enuresis was significantly associated with nocturia in both genders (OR, 1.61; 95% CI: 1.09 - 2.40 in women and OR, 1.66; 95% CI: 1.09–2.52 in men).

Conclusion: There is a significant prevalence of nocturia in our population and a clear association with impaired quality of life. We consider important to inquire about history of childhood enuresis to define the risk of presenting nocturia in adulthood. Nocturia was associated with multiple comorbidities. Obesity and erectile dysfunction play an important role as modifiable risk factor.

1 | INTRODUCTION

Nocturia is a highly-prevalent multifactorial disorder associated with a great impairment in quality of life. It is defined by the International Continence Society (ICS) as the need to wake up at night during the main sleep period, to pass urine. [1]; This definition explains that the first episode is preceded by sleep and that subsequent episodes are followed by the intention to sleep.[1] The definition of nocturia has changed over the past few years. One of the reasons is that waking up once a night to urinate may not be considered bothersome, hence it cannot be considered a "complaint." Furthermore, it is difficult to confirm that the reason for waking up was to urinate.

Nocturia can be an isolated symptom or be part of a symptom complex such as bladder outlet obstruction and overactive bladder (OAB). It can also be related to non-urologic problems, such as congestive heart failure and obstructive apnea, among others. A relationship has also been suggested between lower urinary tract symptoms (LUTS) during childhood and subsequent symptoms in adulthood.[2-4]

Patients commonly perceive nocturia as a normal part of ageing or as an untreatable condition, and therefore, they may not seek medical advice or treatment.[5] Consequently, it does not receive adequate management, generating great emotional, physical, and social problems for patients.[6] Likewise, nocturia generates high economic burden for health care systems as it is associated with other pathologies such as fall-related fractures and depressive symptoms.[7] Recently, Soysal et al.[8] described trends of nocturia in the United States between 2005 and 2016 using data from The National Health and Nutrition Examination Survey. The final analysis included 24,800 subjects aged ≥20 years old, most of whom were non-Hispanic (64.4% of men and 63.4% of women). From 2005 to 2016, the prevalence of nocturia ≥1 increased in both genders. This data shows that there is a tendency towards an increase of nocturia in the entire population, which may have effects on the labor productivity of young adults and falls and/or mortality in the elderly population.

Most studies conducted concerning the prevalence of nocturia have been carried out in Caucasians and developed countries while a relatively low proportion of those studies have targeted Hispanics and ethnic minorities. Understanding the factors associated with nocturia can allow us to comprehend the natural history of this entity. Our study aim is to determine the prevalence of nocturia and associated risk factors in the Colombian population aged ≥18 years old.

2 | METHODS

This is a subanalysis of the Colombian overactive bladder and LUTSs (COBaLT) study,[9] a cross-sectional population-based study conducted in five major cities in Colombia. This study was evaluated and approved by the Institutional Ethics Committee at Hospital Universitario Fundación Santa Fe de Bogotá, Bogotá DC, Colombia according to the tenets of the Declaration of Helsinki (CCEI–3263-2015). Eligible participants were men and women ≥18 years old who were willing and able to give informed consent for participation. Exclusion criteria included subjects unable to respond to the questionnaire, had an active urinary tract infection or were pregnant.

Estimated sample size for the comparison of a proportion in a single sample was calculated, using a population of 48.202.617, an estimated prevalence of LUTS/OAB of 15%, a confidence interval of 95%, a statistical power of 80% and a precision of 3%. Following these parameters, a sample of 1.054 subjects was determined as representative of the population. A multistage probabilistic sampling technique to ensure the randomization of participants was carried out. The definitions were established using the Standardization of Terminology of Lower Urinary Tract Function Report developed by the ICS in 2002[10] and the International Urogynecological Association/ICS Joint Report on the Terminology for Female Pelvic Floor Dysfunction.[11] For a complete description of the COBaLT study design and survey details, consult the original paper.[9]

Nocturia was assessed with the Spanish version of the ICIQ-OAB and was defined as the complaint of waking up at night at least one time to void, according to the ICS definition.[1] Participants were asked the following questions: "During the night, how many times do you have to get up to urinate, on average?" with answer options of none, one, two, three, and four or more and "How much does this bother you?" where they chose a number between 0 (not at all) and 10 (a great deal). For analysis, symptom bother was categorized as 0 ("not at all"), one to four ("mild"), five to seven ("moderate"), and ≥ 8 ("severe"). There is no severity classification established by the ICIQ–OAB, therefore this categorization was performed according to the visual analog scale.[12]

2.1 | Statistical analysis

Descriptive statistics were used to evaluate nocturia prevalence in the general population and categorized

by sex and age groups. Logistic regression analysis was carried out to determine the association of nocturia with childhood enuresis and other variables, using nocturia ≥1 as a dependent variable. Variables that proved statistically significant were included in a multivariate model to examine the association of different conditions and nocturia, controlling for confounders. These were performed separately for the overall population, men and women. The analysis was conducted using STATA/SE V.16.0. statistical software.

3 | RESULTS

A total sample size of 1060 subjects was obtained. The mean age of the participants was 42 years old (range, 18–89). Table 1 shows the demographic characteristics in participants with and without nocturia for both genders. The overall prevalence of nocturia ≥1 was 55.9% ($n = 593$); 53.96% ($n = 320/593$) of the cases occurred in women and 46.04% ($n = 273/593$) in men; 64.92% ($n = 385$) of the subjects reported at least one episode per night, 19.9% ($n = 118$) reported two episodes per night and 15.18% ($n = 90$) reported having ≥3 episodes. Overall, this distribution was greater in subjects between 40–64 years old (41.48%, $p < .01$) and was more frequent in women compared to men (53.96% vs. 46.04%; $p = 0.004$). The prevalence of nocturia ≥1 stratified by sex and age groups is presented in Figure 1. Nocturia was more common in women than in men between the ages of 18–39 years (58.87% vs. 40.47%; $p < .01$) and between the ages of 40–64 years (58.4% vs. 53.5%; $p = .3$), but it was more prevalent in men over 65 years old (84.93% vs. 73.7%; $p = .1$).

TABLE 1 Sociodemographic characteristics of population

	Women		Men	
	No nocturia, $n = 210$	Nocturia, $n = 320$	No nocturia, $n = 257$	Nocturia, $n = 273$
Race[a]				
Hispanic	198 (94.29)	298 (93.13)	248 (96.5)	248 (90.84)
Afro-descendent	8 (3.81)	17 (5.31)	6 (2.33)	17 (6.23)
Aboriginal	3 (1.43)	2 (0.63)	3 (1.17)	7 (2.56)
Education[a]				
None	6 (2.86)	15 (4.69)	3 (1.17)	16 (5.86)
Primary school	42 (20)	82 (25.63)	38 (14.79)	89 (32.6)
High-school	98 (46.67)	134 (41.88)	121 (47.08)	107 (39.19)
Technical	38 (18.1)	73 (22.81)	41 (15.95)	30 (10.99)
College	25 (11.9)	13 (4.06)	46 (17.9)	26 (9.52)
Post-graduate	1 (0.48)	3 (0.94)	8 (3.11)	5 (1.83)
Socioeconomic status[a]				
Low	100 (47.62)	168 (52.5)	110 (42.8)	152 (55.68)
Middle	104 (49.52)	139 (43.44)	130 (50.58)	112 (41.03)
High	6 (2.86)	13 (4.06)	17 (6.61)	9 (3.3)
Marital status[a]				
Single	73 (34.76)	102 (31.87)	120 (46.69)	86 (31.5)
Married	108 (51.43)	164 (51.25)	127 (49.42)	164 (60.07)
Divorced	15 (7.14)	23 (7.19)	8 (3.11)	11 (4.03)
Widow/widower	14 (6.67)	31 (9.69)	2 (0.78)	12 (4.40)
Employment status[a]				
Unemployed	23 (10.95)	41 (12.81)	33 (12.84)	40 (14.65)
Employed	117 (55.71)	163 (50.94)	198 (77.04)	183 (67.03)
Retired	6 (2.86)	9 (2.81)	10 (3.89)	35 (12.82)
Homemaker	52 (24.76)	94 (29.38)	2 (0.78)	6 (2.20)
Student	12 (5.71)	13 (4.06)	14 (5.45)	9 (3.30)

[a]Reported as n (%).

Childhood enuresis was defined as urinary incontinence episodes during sleep in children over 5 years old, according to the International Children's Continence Society.[13] The participants answered the following question: "When you were a child, did you wet the bed?" If the answer was affirmative, we asked: "Until what age did you wet the bed?" History of childhood enuresis was present in 11.96% of the surveyed participants and in 13.66% of the population with nocturia. The frequency of nocturia episodes increases as the history of childhood enuresis was higher ($p = .025$), which is shown in Figure 2.

Figure 3 shows the impact on the quality of life that nocturia has, according to the ICIQ–OAB. The majority of participants with one nocturnal void do not perceive this symptom as bothersome (80%, $p < .01$). The greatest impairment in quality of life was perceived by patients who had three episodes of nocturia per night; in this group, 20.37% of participants perceived a severe negative alteration in the quality of life ($p < .01$).

In the general population, the bivariate model (Table 2) showed an association between nocturia ≥1 and childhood enuresis (odds ratio [OR], 1.45; 90% confidence interval [CI]: 1.04–2.02), afro-descendent race (OR, 1.98; 90% CI: 1.16–3.37), obesity (OR, 1.69; 90% CI: 1.22–2.34), diabetes mellitus (DM) (OR, 2.99; 90% CI: 1.86–4.83), high blood pressure (OR, 2.04; 90% CI: 1.52–2.72), cardiovascular disease (OR, 1.75; 90% CI: 1.08–2.83), depression (OR, 1.89; 90% CI: 1.23–2.89) and obstructive sleep apnea (OSA) (OR, 1.70; 90% CI: 1.17–2.46).

In women, the analysis showed an association with nocturia ≥1 and obesity (OR, 1.68; 90% CI: 1.09–2.58),
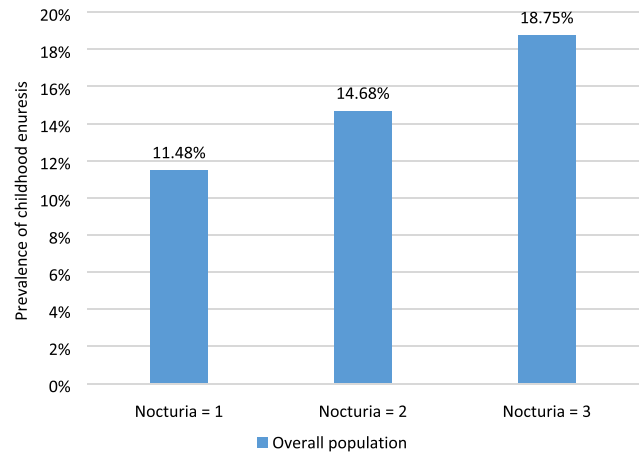

FIGURE 2 Prevalence of childhood enuresis in participants with nocturia

DM (OR, 2.80; 90% CI: 1.43–5.46), high blood pressure (OR, 1.50; 90% CI: 1.02–2.19), cardiovascular disease (OR, 1.97; 90% CI: 1.02–3.79) and menopausal status (OR, 1.39; 90% CI: 1.02–1.90). There were no statistically significant findings with any other variable (Table 2). In men, the logistic regression demonstrates an association between nocturia ≥1 and childhood enuresis (OR, 1.82; 90% CI: 1.16–2.86), DM (OR, 3.31; 90% CI: 1.58–6.21), high blood pressure (OR, 2.85; 90% CI: 1.80–4.51), depression (OR, 2.29; 90% CI: 1.17–4.49) and erectile dysfunction (OR, 4.0; 90% CI: 1.94–8.26). There is a lower probability of nocturia in men with an any educational degree and high/middle socioeconomic status (Table 2).

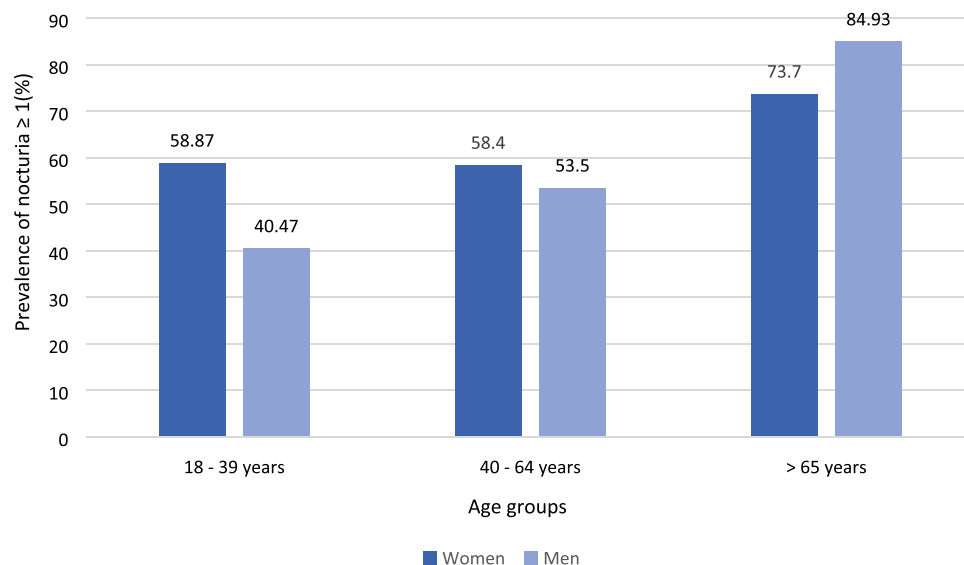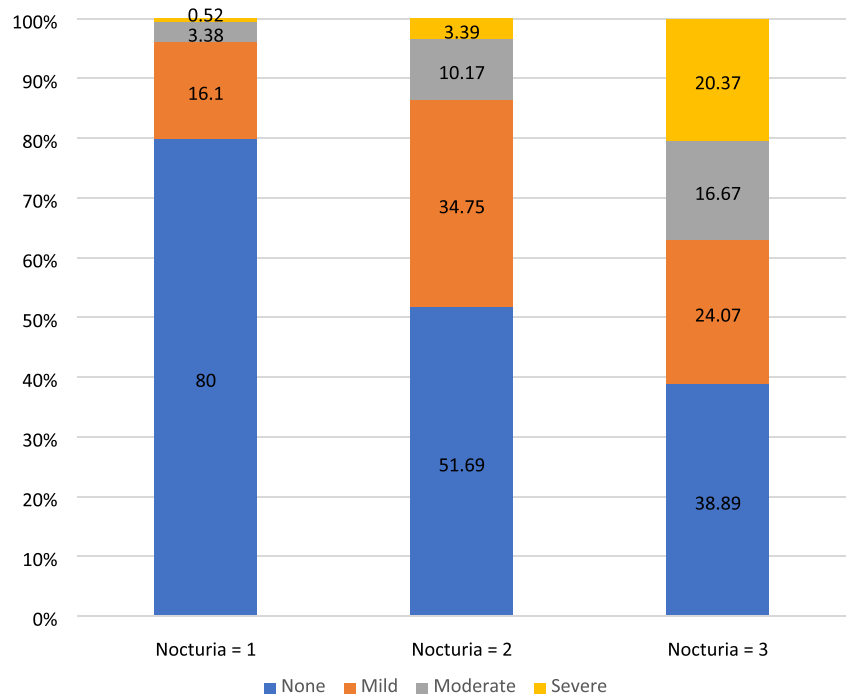When controlling for confounders in the multivariate model, childhood enuresis (OR, 1.61; 95% CI: 1.09–2.40)

FIGURE 1 Prevalence of nocturia according to age groups and sex

FIGURE 3 Prevalence of bothering according to the frequency of nocturia

4 | DISCUSSION

Nocturia is currently defined as a symptom that has a multifactorial etiology. Race or ethnicity may influence the development of LUTS, related to genetic, cultural and environmental factors that can be correlated with pathophysiological mechanisms.[8,14,15] Henceforth, we consider it essential to analyze the Hispanic population with nocturia and its associated risk factors. This will provide useful information that can be used to ascertain the appropriate approach for these patients.

We found a nocturia global prevalence of 55.9%, being higher in women than in men (53.9% vs. 46.03%; $p = .004$). Our findings are consistent with previous research that has estimated the prevalence of nocturia, in which age and gender are associated factors.[16-19] To date, the EpiLUTS cross-sectional study is one of the largest studies performed to determine the prevalence of LUTS.[15] A secondary analysis of the data showed a prevalence of nocturia ≥1 in 76% of women and 69% of men. Although their prevalence was higher than reported in our population, the relationship between gender is

and obesity (OR, 2.0; 95% CI: 1.14 - 3.51) had an association with nocturia in women. On the other hand, in men, we found an association with ages ≥65 years (OR, 3.18; 95% CI: 1.26–8.02), childhood enuresis (OR, 1.66; 95% CI: 1.09–2.52) and erectile dysfunction (OR, 3.44; 95% CI: 1.21–9.72) (Table 3).

conserved. Moreover, their study mainly included Caucasian population aged ≥40 years with Hispanic population of 2.96%, which could explain these dissimilarities. The gender-related differences can be explained by increased susceptibility to sleep fragmentation in young women, related to childcare or insomnia, and prostatic problems in older men.[15,16,19]

In Latin America, there is limited information about the prevalence of nocturia and associated factors. A population-based study by Soler et al.[20] reported nocturia as one of the most frequently perceived LUTS in Brazil, with a prevalence of 32.4% in women and 27.1% in men. These results differ significantly from our findings; however, they used a definition of nocturia ≥2 and the study was limited to the population aged ≥40 years old. Similarly, Moreira et al.[21] reported a nocturia prevalence ≥2 of 71.2% in women and 64.4% in men aged ≥30 years old, in the third largest city in Brazil. The higher proportion of menopausal women included might explain the higher incidence of nocturia in this cohort, compared to our results. Nevertheless, none of these studies were focused on evaluating nocturia differences between genders, nor demonstrating associations to age groups or comorbidities. There is heterogeneity in most of the research conducted, mainly due to the definitions used, population groups selected, and sampling methodology.

In the present study we found multiple conditions associated with nocturia, which highlights the multifactorial etiology of this condition. Common chronic diseases including DM, high blood pressure, cardiovascular

	Overall		Women		Men	
	OR	90% CI	OR	90% CI	OR	90% CI
Demographic characteristics						
Age, years						
18–39	1.0	Referent	1.0	Referent	1.0	Referent
40–64	1.32	1.06–1.64	0.98	0.72–1.33	1.69	1.24–2.31
≥65	4.09	2.78–6.01	1.96	1.16–3.32	8.29	4.65v14.77
Race						
Hispanic	1.0	Referent	1.0	Referent	1.0	Referent
Afro-descendent	1.98	1.16–3.37	1.41	0.68–2.90	2.83	1.28–6.27
Aboriginal	1.22	0.51–2.93	0.44	0.97–2.00	2.33	0.74–7.33
Education						
None	1.0	Referent	1.0	Referent	1.0	Referent
Primary school/high-school	0.40	0.21–0.75	0.62	0.27–1.39	0.23	0.80–0.66
Technical/college	0.27	0.14–0.52	0.55	0.24–1.26	0.12	0.41–0.35
Post-graduate	0.25	0.09–0.71	1.2	0.15–9.40	0.12	0.03–0.47
Socioeconomic status						
Low	1.0	Referent	1.0	Referent	1.0	Referent
Middle	0.70	0.57–0.86	0.79	0.59–1.07	0.62	0.46–0.83
High	0.62	0.37–1.0	1.28	0.56–2.98	0.38	0.19–0.78
Marital status						
Single	1.0	Referent	1.0	Referent	1.0	Referent
Married	1.43	1.15–1.78	1.09	0.78–1.50	1.80	1.33–2.44
Divorced	1.51	0.94–2.44	1.10	0.60–2.00	1.91	0.86–4.26
Widow/widower	2.75	1.65–4.59	1.58	0.88–2.84	8.37	2.33–30.04
Employment status						
Unemployed	1.0	Referent	1.0	Referent	1.0	Referent
Employed	0.75	0.55–1.03	0.78	0.48–1.25	0.76	0.50–1.16
Retired	1.90	1.08–3.32	0.84	0.32–2.21	2.88	1.42–5.84
Homemaker	1.28	0.85–1.90	1.01	0.61–1.69	2.48	0.61–10.01
Student	0.58	0.33–1.01	0.60	0.28–1.33	0.53	0.24–1.18
Comorbid conditions						
Obesity (BMI > 30 kg/m^2)	1.69	1.22–2.34	1.68	1.09–2.58	1.57	0.96–2.57
Diabetes mellitus	2.99	1.86–4.83	2.80	1.43–5.46	3.13	1.58–6.21
High blood pressure	2.04	1.52–2.72	1.50	1.02–2.19	2.85	1.80–4.51
Cardiovascular disease	1.75	1.08–2.83	1.97	1.02–3.79	1.37	0.66–2.85
Anxiety	1.23	0.74–2.05	1.01	0.52–1.95	1.49	0.66–3.36
Depression	1.89	1.23–2.89	1.55	0.89–2.69	2.29	1.17–4.49
Obstructive sleep apnea	1.70	1.17–2.46	1.56	0.96–2.51	1.72	0.95–3.11
Neurological disease	2.18	0.83–5.74	1.65	0.41–6.58	2.86	0.74–11.06
Childhood enuresis	1.45	1.04–2.02	1.17	0.71–1.92	1.82	1.16–2.86
Irritable bowel syndrome	0.97	0.66–1.42	0.77	0.49–1.22	1.23	0.60–2.50
Overactive bladder	2.42	1.92–3.05	2.80	1.43–5.46	2.97	2.07–4.26
Erectile dysfunction	–	–	–	–	4.00	1.94–8.26
Obstetric and gynaecological history						
Pelvic organ prolapse	–	–	1.02	0.49–2.09	–	
Hysterectomy	–	–	1.66	0.96–2.86	–	
Post–menopausal	–	–	1.39	1.02–1.90	–	

TABLE 2 Bivariate analysis for nocturia associated factors in the general population, women, and men

	Overall		Women		Men	
	OR	90% CI	OR	90% CI	OR	90% CI
History of pregnancy	–	–	1.08	0.75–1.56	–	
History of vaginal deliveries	–	–	1.3	0.84–1.99	–	
Habits						
Physically active	1.26	1.00–1.60	1.34	0.95–1.87	1.19	0.86–1.67
Cigarette smoking						
Never smoked	1.0	Referent	1.0	Referent	1.0	Referent
Previous smoker	1.5	1.21–2.01	2.09	1.34–3.24	1.58	1.13–2.21
Active smoker	0.68	0.51–0.92	0.76	0.47–1.26	0.76	0.52–1.11

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio.

disease, and OSA were associated with nocturia. These results are consistent with previous studies that have associated nocturia with other medical conditions and linking nocturia with poor health status.[22]

The association between DM and nocturia has previously been reported variably between studies. EpiLUTS showed DM was associated with nocturia ≥2 in logistic regression in both genders.[15] The FINNO study found an association of nocturia ≥2 and DM in the age-adjusted analysis, for both genders. However, the multivariate analysis only found an association in women.[23] In the present study, we found an association between DM and nocturia ≥1 in both genders, but this was not statistically significant when we controlled for confounding variables. These differences among studies can be explained in the definitions used and the variables selected for the statistical analysis. The association between high blood pressure and nocturia is also supported by epidemiological evidence. The EpiLUTS study reported high blood pressure as a risk factor for nocturia in both genders.[15] Likewise, Chow et al.[22] reported that hypertension is an

TABLE 3 Multivariate logistic regression analysis to identify association with nocturia in women and men

	AOR[a]	95% CI
Women[a]		
Obesity	2.00	1.14–3.51
Childhood enuresis	1.61	1.09–2.40
Men[b]		
Age ≥ 65	3.18	1.26–8.02
Childhood enuresis	1.66	1.09–2.52
Erectile dysfunction	3.44	1.21–9.72

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; SES, socioeconomic status.
[a]Adjusted by diabetes mellitus and cardiovascular disease.
[b]Adjusted by age groups, educational degree and SES.

independent risk factor for nocturia in the general population (OR, 2.04; 95% CI: 1.85–2.24) and this was maintained by stratifying the analysis by gender. Similar results were found in our study, in which high blood pressure was associated with nocturia in the general population, in both women and men. OSA was also found as a risk factor for nocturia in our results which is consistent with previously published studies.[15,24,25] In a meta-analysis conducted by Zhou et al.,[26] OSA was associated with nocturnal urination, especially in male population (RR = 1.487; 95% CI, 1.087–2.034; $p = .013$).

When we controlled for confounding variables, the multivariate analysis also identified an association with nocturia ≥1, age and ED in men (OR, 3.44; 95% CI, 1.21–9.72). Previous studies have addressed the relationships between LUTS and sexual dysfunction.[27,28] Mariappan et al[29] carried out a cross-sectional survey in 418 men aged ≥40 years which found that nocturia was correlated with ED (OR, 2.5; 95% CI, 1.5–4.2). A web-based survey conducted in 1464 sexually active men aged between 20 and 69, found nocturia was significantly related to "any degree of ED" (OR, 1.238; 95% CI, 1.07–1.42; $p = .003$).[28] This relationship has been attributed to common pathophysiological mechanisms related to aging and comorbidities. such as obesity, high blood pressure and diabetes mellitus.[30] On the other hand, the multivariate analysis also showed a relationship between nocturia ≥1 and obesity in women. BMI has been associated with nocturia in several studies.[31–33] Vaughan et al.[31] evaluated the effect of obesity on urinary tract symptoms in a cohort of 3727 adults ≥18 years old; they found obesity was associated with nocturia in men (OR, 1.98; 95% CI, 1.18–3.34) and women (OR, 2.37; 95% CI, 1.48–3.82). Similarly, Moon et al.[32] reported a positive association between BMI > 30 kg/m^2 and nocturia in both genders, being the OR in women higher than in men (OR, 1.34; 95% CI, 1.19–1.51 and OR, 1.42; 95% CI, 1.27–1.58, respectively). The intraabdominal pressure can increase as a consequence of obesity, which in turn

produces an increase of the pressure on the bladder, alterations in the pelvic floor, organ pelvic prolapse as well as urethral hypermobility. These changes could be responsible for urinary symptoms in women, including nocturia.[33] Men do not present the aforementioned anatomical changes, which would explain the differences between genders found in our study.

With respect to childhood enuresis, around 1.5%–3% of patients who are diagnosed in childhood have the condition persist into adulthood.[3,34] Our study found that childhood enuresis was significantly associated with nocturia in both genders (OR, 1.61; 95% CI: 1.09–2.40 in women and OR, 1.66; 95% CI: 1.09–2.52 in men). Fitzgerald et al.[2] also reported an association between childhood enuresis and adult nocturia (OR, 2.3, 95% CI:1.5 - 3.5) in women ≥40 years old. The authors concluded that childhood symptoms as nocturia and nocturnal enuresis were strongly associated with symptoms in middle-aged and older women. An internet-based questionnaire survey conducted by Othman et al.[35] described the prevalence of nocturia ≥2 was higher in women with a history of childhood enuresis. However, this study was based only on the female population. Similarly, the EpiLUTS study found that enuresis history was more common as the number of nocturia episodes increased, both in men and women.[15] This is equivalent to our results regarding the frequency of nocturia episodes and childhood enuresis history (Figure 2). These two entities share common pathophysiology related to abnormal nocturnal urine production, variations in bladder capacity, and inconsistent sleep patterns.[3] Children with a history of nocturnal enuresis usually have a family history of enuresis and it is known that there are genetic factors involved.[36,37] In nocturia, there is a potential genetic association due to the difference in prevalence found by ethnic groups although no clear causality has been found.[37] It has been described that a third of patients with nocturnal enuresis could experience nocturia in adulthood, even if they received treatment, which also suggest a genetic susceptibility.[8,14,15,38] Nocturnal polyuria (NP) is a known cause of both conditions. In children, it is related to disturbances in water handling caused by alterations in the circadian rhythm of vasopressin. Similarly, in adults, NP can be produced to abnormal vasopressin secretions but may also be related to diuretic use, heart failure, and OSA.[37]

The prevalence of nocturia vary depending on the geographic location, probably related to differences in the diet, habits, perception of symptoms, cultural and socioeconomic factors. It has been described that socioeconomic factors, such as unemployment, low educational level or low income, increase the risk of health inequality.[39] In the present study, having a high educational level was found as a protective factor for nocturia. People with a higher educational level have a greater consciousness of their health status and better access to medical care.[15,40] In Colombia, 15.1% of the population did not have geographical access to healthcare system services within a 2 h driving distance, during 2016.[41] This highlight difficulties in accessing health services and inequities in the population. Similarly, in Latin-American developing countries, the cultural context favors the existence of poor income distribution, poor quality education and inadequate housing conditions.[39] Behavioral influences, such as high caffeine consumption, can also have an effect on the presentation of this condition. Understanding the impact of socioeconomic and cultural factors can be helpful in the counseling and management of these patients.

Strengths of the present study include its population-based longitudinal design and the use of a multi-stage probabilistic sampling technique, which allowed us to ensure that it is representative of the population and to minimize selection bias. In addition, a validated questionnaire (ICIQ–OAB) was used for evaluating nocturia and its impact on the quality of life. The analysis was conducted according to the updated definitions of ICS. However, the use of validated instruments may inaccurately estimate nocturia prevalence compared with studies involving voiding diaries. Additionally, we need to mention that recall bias is a limitation of the present study. This may influence answers about symptoms during childhood, producing inaccuracy in the measurement of this variable. Despite these limitations, the present study provides useful information on a highly prevalent condition, which may have a significant influence on the assessment and management of these patients.

5 | CONCLUSION

There is a significant prevalence of nocturia in our population and a clear relationship between this entity and negative alterations in quality of life. Prevalence is observed predominantly in middle-aged women; however, in men over forty, there is an increase in the prevalence. An association between nocturia and childhood enuresis was found to be relevant in both genders. We consider it important to inquire about the history of childhood enuresis as a potential risk factor for nocturia in adult life. Other factors dependent on modifiable aspects of global health, such as obesity in women and erectile dysfunction in men, were also shown to be related to the presence of nocturia in our population.

CONFLICT OF INTERESTS

AUTHOR CONTRIBUTIONS

Study concept and design: Julián Azuero, Mauricio Plata and Jessica Santander. Analysis and interpretation of data: Mauricio Plata, Martín Rondon, and Jessica Santander. Drafting of the manuscript: Julián Azuero, Jessica Santander and Laura Zuluaga. Critical revision of the manuscript for important intellectual content: Carlos Trujillo, Juan Ignacio Caicedo, Fabián Daza, Ana María Becerra y Laura Zuluaga.

DATA AVAILABILITY STATEMENT

In accordance with the "DFG Guidelines on the Handling of Research Data," we will make all data available upon request. The data set will be archived for at least 10 years after publication.

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