

Female Urology, Urodynamics, Incontinence, and Pelvic Floor Reconstructive Surgery

Prevalence, Risk Factors, and Treatment for Overactive Bladder in a Racially Diverse Population



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OBJECTIVE	To evaluate differences in prevalence, overactive bladder (OAB) risk factors, and OAB treatment in a diverse population of underrepresented racial/ethnic groups.
METHODS	This is a retrospective cohort study of women ≥ 18 years who had an OAB diagnosis code from June 1, 2013 to June 30, 2016. Women who had neurogenic bladder or pelvic cancer were excluded. OAB risk factors included age, body mass index, socioeconomic status, diabetes, and smoking. OAB treatment included consultation with a specialist, diagnostic testing, medication, and third-line therapy (neuromodulation or chemodenervation). ANOVA and Chi-square were used to compare continuous and categorical variables. Multivariable logistic regression models were developed to examine the association between racial/ethnic groups and OAB management while controlling for risk factors.
RESULTS	OAB prevalence was 4.41% (5407/122,606) and was highest in Hispanic women. Black and Hispanic women were significantly younger, had a higher median body mass index, higher rate of diabetes, and lower socioeconomic status compared to White women. There was no racial difference in OAB prescriptions. Black women were less likely to consult with a specialist in multivariable analysis.
CONCLUSION	OAB prevalence and presence of OAB risk factors was highest in Hispanic and Black women. Black women were less likely to consult with a specialist suggesting that Black women receive initial therapy from primary care physicians. Future studies will evaluate if racial differences in OAB treatment are due to patient preference or provider practices. UROLOGY 126: 70–75, 2019. © 2018 Elsevier Inc.

Overactive bladder (OAB) is a symptom complex characterized by “urgency, with or without urge incontinence, usually with frequency and nocturia,” that significantly affects quality of life.¹ Several studies have demonstrated the negative impact of OAB including increased health care visits,² higher rates of depression and anxiety,^{3,4} poorer quality of sleep,⁴ increased injury from falls,² increased rate of urinary tract infection,² and reduced work productivity.⁵ In the United States (US), the estimated direct annual cost of OAB in 2007 was a staggering \$51.4 billion in addition to \$14.6 billion lost due to missed work. The total

national cost is projected to be as high as \$82.6 billion in 2020.⁶ However, these figures may be underestimated since they are based on prevalence data from 2003.

More recent studies have reported the prevalence of OAB in the US. The first was the National Overactive Bladder Evaluation (NOBLE) from 2003,⁴ followed by the Epidemiology of Lower Urinary Tract Symptoms (Epi-LUTS) in 2007,⁷ and OAB on Physical and Occupational Limitations (OAB-POLL) in 2010.⁸ These are national cross-sectional studies that used internet or telephone-based surveys. The prevalence of OAB was 16.9% in the NOBLE study and 30% in OAB-POLL in women 18 and older. The Epi-LUTS study evaluated women 40 and older and found that 35.7% reported urgency at least sometimes. In contrast to patient reported OAB, a study measuring prevalence using OAB diagnosis codes in an electronic medical record (EMR) database from 2009 to 2012 found a prevalence of 3.4% in men and women 18 and older.⁹ The reported prevalence of OAB in the US is noticeably inconsistent due to different measurement tools, definitions of OAB, and populations sampled, thereby demonstrating the need for further investigation.

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The objectives of our study were to: (1) determine the prevalence and incidence of OAB across racial groups in a racially and ethnically diverse population of women and (2) evaluate racial differences in risk factors and treatment for OAB, including consulting with a specialist, undergoing diagnostic tests, and receiving medication for OAB. We hypothesized that the prevalence and incidence of OAB would be highest in Black women and that they would be more likely to undergo treatment for OAB.

METHODS

This is a cohort study of women aged 18 years or older, enrolled in an urban health care system with 3 divisions and 1492 inpatient beds. Its large outpatient delivery system saw 240,720 unique female patients greater than or equal to 18 years of age in 2016 in 1,807,738 outpatient encounters. Female patients with an OAB diagnosis from June 1, 2013 to June 30, 2016 were identified. OAB diagnoses included¹: hypertonicity of bladder, urge incontinence, incontinence w/o sensory awareness, urgency of urination, and OAB or a problem list finding of urge incontinence, urinary urgency, or urinary incontinence without awareness. Frequency and nocturia were not included to avoid misclassification since the hallmark of OAB is urgency. However, sensitivity analyses were performed to evaluate whether patients with this diagnosis underwent OAB treatment. Exclusion criteria included disorders that cause neurogenic bladder and other pathology that could cause OAB symptoms. Excluded codes included²: neurogenic bladder, multiple sclerosis, Parkinson's disease, cerebrovascular disease, personal history of other diseases of circulatory system, spinal bifida, spinal cord injury, radiation cystitis, paraplegia, paralysis, cerebral palsy, quadriplegia, urethral cancer, bladder cancer, uterine or cervical cancer, vaginal cancer, urethral diverticulum, urethral stricture, interstitial cystitis.

Race/Ethnicity

The racial/ethnic distribution in our local community according to the 2013 Census Bureau is 10.5% non-Hispanic White, 43.3% Black, 54.6% Hispanic (any race), and 4.2% Asian. In the EMR, patients have the option of specifying race and ethnicity. Non-Hispanic Whites were coded as White, and non-Hispanic Blacks were coded as Blacks. Those that self-identified as Hispanic were coded as Hispanic regardless of their racial group identification. The "other" group represents individuals outside of these 3 primary groups.

¹ ICD-9/10 CM codes: (596.51); (788.31/N39.41); (788.34/N39.42); (788.63/R39.15); (N32.81)

² ICD-9/10 CM codes: (596.54, 596.55, 344.61); (340, 341.0, 341.1, 341.8, 341.9); (332.0, 332.1, 333.0, 094.82); (436, 435.9, 997.02, V12.59); (741, 741.0, 741.9, and 756.17); (952.x); (595.82); (344.1); (344.9); (343.x); (344.x); (189.3); (188.x); (179, 180, 180.0, 180.1, 180.8, 180.9, 182, 182.0, 182.1, 182.8); (184,184.0); (599.2); (598.x); (595.1).

Other Variables

In addition to race, other demographic variables collected included age and neighborhood socioeconomic status (SES). Neighborhood SES was calculated using the method of Roux 100 standardized on New York State Mean census block group SES.²³

OAB Treatment

Several variables were used to measure OAB treatment including prescription for an OAB medications (Oxybutynin, Tolterodine, Darifenacin, Solifenacin, Trospium, Fesoterodine, Mirabegron), consultation with a specialist (urologist or urogynecologist), and completion of a diagnostic test including urodynamics, cystoscopy, postvoid residual, and renal/bladder ultrasound. Although OAB is a clinical diagnosis and there is no test diagnostic of OAB, we included these diagnostic tests as a potential measure of care provided to evaluate and manage OAB in these patients. Physical therapy was queried by looking at current procedural terminology codes for pelvic floor electromyography, electrical stimulation, and physical performance test. Third line therapies were percutaneous tibial nerve stimulation, sacral modulation, and onabotulinum toxin A injection (Botox).

Risk factors for OAB such as body mass index (BMI), smoking status, and diabetes were also evaluated. Diabetes was classified as HgbA1c >6.5, ICD9/10 code for diabetes, or a prescription for diabetic medications.

Prevalence Calculation

Prevalence was calculated for the time period of June 1, 2013 to June 30, 2016. Women included were 18 years or older, seen at least once a year for 3 consecutive years, and did not have any of the exclusionary diagnoses previously listed. Cases were women who had ever had an OAB ICD 9/10 diagnosis code or ever prescribed medication for OAB. Prevalence was calculated as cases of OAB over total population.

Incidence Calculation

Incident cases of OAB were used for analysis of racial differences in OAB treatment. Incident cases were women who had at least 1 outpatient visit during the study period of June 1, 2013-June 30, 2016 and had been newly diagnosed with OAB using the diagnosis codes listed previously. Ongoing care in the system was assumed and verified by evaluating the number of women who underwent a repeat outpatient visit 365-730 days after their first visit. Women who met exclusion criteria or were prescribed medication for OAB in the 10 years prior were excluded.

Cohort Building and Outcomes Software

All cohorts and Time to Outcome analyses were built using Looking Glass Clinical Analytics (Streamline Health, Atlanta, Georgia), a user-friendly interactive software application for the evaluation of health care quality, effectiveness, and efficiency. The system integrates clinical and administrative datasets allowing nonstatisticians

to produce epidemiologically cogent self-documenting reports globally assessing care quality while identifying the specific patients in need of clinical remediation.

Statistical Analysis

Demographic variables, OAB risk factors, and diagnostic test use were summarized using descriptive statistics. ANOVA analysis was used to compare continuous variables and Chi-square test for categorical variables. A sensitivity analysis was performed on the Hispanic group, using the sub-classifications Hispanic-Black, Hispanic-White, and Hispanic-other, to ensure no significant difference when grouping all Hispanics together. Multivariate logistic regression models were developed to examine the association between racial/ethnic groups and OAB management while controlling for other patient-related factors: age, BMI in categories, SES, and diabetes. For all the models White, non-Hispanic was the reference. Models were built with these outcome variables: consultation with a specialist, prescription of any OAB medication, and progression to any third line therapy. Backward elimination model building was performed with other patient-related factors: age, BMI, SES, and diabetes. A $P < .05$ was significant. All statistical analysis was performed using STATA version 14.2 (StataCorp. 2015. College Station, TX: StataCorp LP).

RESULTS

OAB prevalence was 4.41% using our case definition. When prevalent cases were stratified by age and race, OAB prevalence was significantly ($P < .01$) higher in Hispanic women across all age groups. Black women had statistically higher rates of OAB than Whites, $P < .01$ (Table 1).

The demographics of women with incident OAB are summarized in Table 2. In this group, 85.6% (2596/3031) of these women had a repeat visit 365-730 days after their first visit confirming continuous care in our system. Black and Hispanic women were significantly younger (median age 52 (IQR 39, 66), 53 (IQR 39, 66), had a higher median BMI (31 [6.37], 30 [5.99]), higher rate of diabetes (30%, 29%), and lower SES (-1.97 [IQR -5.45 , -1.00],

-3.83 [IQR -6.61 , -1.59]), respectively, compared to White women (median age 61 [IQR 50, 74], median BMI 28 [6.10], diabetes 19%, SES -0.65 [-2.25 , 0.86]).

OAB treatment varied by race (Table 3), 36.9% of women consulted with a specialist (urologist or urogynecologist). Of these women, Black women were significantly ($P < .001$) less likely to consult with a specialist compared to the other racial/ethnic groups. Diagnostic tests were undergone by 16.1% of women and 6.0% underwent urodynamics. Black women were significantly less likely to undergo any diagnostic test or urodynamics. However, there was no racial difference in prescription for OAB medication. Prescription of medicine were given to 15.7% of women within 2 days of their outpatient diagnosis and 23.9% at 365 days after diagnosis. Of the 725 women started on medication, 176 (24.3%) had another prescription for a medication within the following 6 months to 1 year. Only 12 of 1117 women (1.1%) who had seen a specialist received any third line therapy within 1 year after diagnosis. Five additional women received third line therapy within 2 years after diagnosis.

Racial differences in OAB treatment persisted in multivariable analyses adjusting for age, diabetes, and SES (Table 4). Black women were significantly ($P < .01$) less likely to consult with a specialist compared to White women. There was no racial difference in diagnostic testing or medication prescription.

Sensitivity analyses were performed to evaluate whether patients with OAB could have been coded with frequency or nocturia instead. Women coded with frequency or nocturia were 7457, of whom 1057 also had a concomitant OAB diagnosis code. Of the remaining 6400 women, 482 (7.5%) consulted with a specialist and 257 (4.0%) received OAB medication, suggesting we would not miss a significant number of OAB cases by excluding these diagnosis codes.

DISCUSSION

Racial differences in the prevalence of OAB are inconsistent. The majority of prior studies have looked at racial differences in urgency urinary incontinence (UUI), with

Table 1. Prevalence of OAB cases stratified by age and race/ethnic groups from June 2013 through Jun 2016

Age Range (y)	Race	OAB Cases	Total	Prevalence %	P Value
18-39	Black	552	11,866	4.65	<.01
	White	125	3073	4.07	
	Hispanic	823	15,351	5.36	
	Other	163	4889	3.33	
40-65	Black	876	21,373	4.10	<.001
	White	226	7629	2.96	
	Hispanic	1131	22,777	4.97	
	Other	282	9702	2.91	
≥66	Black	471	8471	5.56	<.001
	White	243	5653	4.30	
	Hispanic	545	7942	6.86	
	Other	170	3880	4.38	
Overall prevalence		5407	122,606	4.41	

Table 2. Demographics and OAB risk factors in Incidence population (n = 3031)*

Characteristics	Black n = 913	White n = 338	Hispanic n = 1277	Other n = 503	P Value [†]
Age, y	52 (39, 66)	61 (50, 74)	52(39, 66)	55 (41, 68)	<.001
BMI [‡]	30.77 (26.67, 35.63)	26.95 (23.69, 31.57)	29.6 (25.96, 34.49)	28.46 (24.71, 33.65)	<.001
SES [‡]	-1.97 (-5.45, -1.00)	-0.65 (-2.25, 0.86)	-3.83 (-6.61, -1.59)	-2.42 (-5.78, -0.74)	<.001
Diabetes, n (%) [¶]	274 (30.01)	64 (18.93)	365 (28.58)	116 (23.06)	<.001

Data are presented as median (interquartile range) unless otherwise noted.

* SES, socioeconomic status; BMI, body mass index.

[†] Based on ANOVA (continuous variable), χ^2 (categorical variables), Kruskal-Wallis test (continuous variables).

[‡] Number of observations: BMI 633; SES 68.

[¶] Diabetes: HA1C > 6.5, ICD 9/10 codes for diabetes, or diabetic medication.

Table 3. Evaluation and treatment of women with OAB in the outpatient setting in the incidence population

	All participant (n = 3031)	Black (n = 910)	White (n = 339)	Hispanic (n = 1274)	Other (n = 508)	P Value*
Consultation with a specialist	1117 (36.85)	270 (29.67)	130 (38.35)	512 (40.19)	205 (40.35)	<.001
Physical therapy	86 (2.84)	20 (2.20)	12(3.54)	40 (3.14)	14 (2.76)	.49
Diagnostic test						
Any diagnostic test	488 (16.10)	120 (13.19)	56 (16.52)	243 (19.07)	69 (13.58)	<.001
Post void residual	131 (4.32)	29 (3.19)	16 (4.72)	67 (5.26)	19 (3.74)	.11
Cystoscopy	84 (2.77)	18 (1.98)	6 (1.77)	45 (3.53)	15 (2.95)	.10
Renal bladder US	174 (5.74)	58 (6.37)	22 (6.49)	75 (5.89)	19 (3.74)	.18
Urodynamics	183 (6.04)	34 (3.74)	24 (7.08)	100 (7.85)	25 (4.92)	<.001
Medications						
Any medications	725 (23.92)	196 (21.54)	81 (23.89)	323 (25.35)	125 (24.61)	.22

^{*} Based on χ^2 (categorical variables).

some reporting a higher rate of UUI in African American (AA) women compared to Whites,¹⁰⁻¹² others showing no racial difference,¹³⁻¹⁷ and 1 study showing a lower UUI rate in AA women.¹⁸ OAB, an umbrella term that also includes urgency without incontinence,¹ was coined in 2002 and is included in more recent studies. The prevalence of OAB was slightly higher in AA women,^{8,19,20} however AA race was no longer associated with OAB in multivariable analyses adjusting for risk factors.¹⁹ Some of these studies did not include a high percentage of minorities or selected for a population that would complete internet surveys.

Few studies have evaluated racial differences in treatment of OAB. There appears to be no racial/ethnic difference in use of medical therapy for OAB.²¹ There are no studies evaluating race and use of botulinum toxin. A study on disparities in use of sacral neuromodulation in Medicare beneficiaries found that non-Whites were significantly less likely to undergo sacral neuromodulation compared to Whites on multivariable analysis (OR 0.38 (0.27-0.53, $P < .0001$)).²² Differences among racial subgroups were not evaluated.

Our study is novel in that we identified a higher prevalence of OAB in Hispanic women compared to Black and White women based on a provider diagnosis of OAB. Additionally, we identified that Black women are less likely to consult with a specialist. However, there was no racial difference in medication prescription for OAB.

Goldman et al performed a similar study using EMR to evaluate prevalence and treatment of OAB in men and women using the Humedica database.⁹ The prevalence of OAB in men and women was 3.42%. Our prevalence was slightly higher at 4.41%. In their study, 33.8% of women with OAB were prescribed medications compared to 23.9% in our study. Similar to our finding of 6.04%, 6.93% underwent urodynamics. Our study design differs in that we used a more stringent list of diagnosis codes for OAB and only evaluated women. We also evaluated racial differences in prevalence and treatment. Caucasians were overrepresented and patients with Medicaid were not represented in the Goldman study, whereas in our study population Black and Hispanic women are overrepresented and patients are primarily covered by Medicaid.

The reasons for racial differences in OAB prevalence and treatment are likely multifactorial. Hispanic women in our population may be more bothered by OAB or feel more comfortable seeking care, thus resulting in providers documenting OAB in their records. Alternatively, Hispanic women may be biologically more susceptible to developing OAB. Hispanic refers to people originating from Spanish-speaking countries and includes Mexican Americans, Central and South Americans, Puerto Ricans, Cubans, and others.²⁴ Our Hispanic population is predominantly of Caribbean origin whereas the other studies in the literature have evaluated Mexican-American women. Anatomic differences in urethral sphincter

Table 4. Multivariable logistic regression comparing OAB management across racial/ethnic groups in the incidence population

Race/ Ethnic Group	Seen Specialist		Any Diagnostic Test		Urodynamics		Prescribed Medication	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
White	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Black	0.60 (0.45, 0.81) *	0.63 (0.44, 0.83) *	0.72 (0.48, 1.06)	0.72 (0.48, 1.08)	0.59 (0.31, 1.12)	0.56 (0.29, 1.10)	0.93 (0.66, 1.31)	0.98 (0.68, 1.41)
Hispanic	0.89 (0.67, 1.18)	0.88 (0.65, 1.18)	1.15 (0.80, 1.65)	1.15 (0.78, 1.69)	1.41 (0.80, 2.48)	1.31 (0.72, 2.40)	1.20 (0.87, 1.66)	1.24 (0.88, 1.78)
Other	0.79 (0.57, 1.10)	0.78 (0.55, 1.09)	0.67 (0.42, 1.06)	0.67 (0.42, 1.08)	0.65 (0.31, 1.38)	0.62 (0.29, 1.34)	0.97 (0.66, 1.43)	0.99 (0.66, 1.47)

Adjusted for age, socioeconomic status, body mass index, and diabetes.

* $P < .05$.

morphology and closure pressure and levator hiatal dimensions between Black and White women have been reported^{25,26} suggesting an anatomic predisposition to certain types of urinary incontinence. The higher prevalence in our study may be unique to Caribbean Hispanics (Puerto Ricans and Dominicans), which may be due to African ancestry²⁴ or Hispanic women may have unique anatomic findings that have yet to be described. Race could also be a proxy for an unmeasured risk factor for OAB. For example, anxiety²⁷ or perceived stress²⁸ is positively correlated with urgency incontinence symptoms. The majority of our patient population lives at or below the poverty line. These factors may be closely related to race, thereby accounting for the differences seen in OAB prevalence.

Racial differences in OAB treatment may be due to lack of knowledge. A study on racial difference in seeking treatment for urinary incontinence found that 94% of women “did not think anything could be done,” although the rate was similar for Blacks and Whites.²⁹ In our population, Blacks may be more likely to think their condition is not treatable or fear associated stigma of a diagnosis and not seek specialist care. For example, Blacks were less likely to seek medical care for mental health and neurologic issues compared to whites.³⁰ On the other hand, the difference in consultation with a specialist may be a reflection of providers not referring their patients for specialist care. It is also possible that Black women in our study have milder OAB and do not require specialist care.

The American Urological Association OAB guidelines do not mandate the use of diagnostic testing as OAB is a clinical diagnosis. Few women received any form of diagnostic testing.

Third line therapies were utilized in less than 2% of our study population. It is not clear whether third line therapies were underutilized since we did not know how many patients had OAB refractory to first and second line therapies. We noticed that our low numbers were a product of our restricted time period, which suggests that in spite of low medication prescription rates, third line therapies may be offered only 2 years after OAB diagnosis.

There are several limitations to this study. Use of the EHR to determine prevalence and incidence relies on accurate coding by physicians and thus our numbers may be an underestimate. We also assumed that incident cases represented women who use our system as their primary source of healthcare. The EHR does not provide details on severity of OAB or degree of bother, which would affect seeking treatment. We could not measure whether patients pursued conservative treatment measures such as behavioral modification and self-guided pelvic floor exercises. We are also unable to ascertain if differences in treatment are due to patient preference or provider practices. Finally, whites are a minority in our ethnically diverse patient population and most of our patients are of low socioeconomic status and covered by Medicaid. Thus, these findings are not generalizable to other populations.

Despite these limitations, our study reveals novel information regarding racial differences in prevalence and treatment of OAB, even after adjusting for potential risk factors. Racial differences may point to a biological variation that may help us better understand the etiology of OAB and how to optimize and individualize treatment.

CONCLUSION

OAB prevalence was highest in Hispanics, followed by Black women. There was no racial difference in medical therapy for OAB. However, Black women were less likely to consult with a specialist. This suggests that Black women receive initial therapy from primary care physicians but are less likely to move on to consultation with a specialist and third-line therapies. Future studies will evaluate if racial differences in OAB treatment are due to patient preference or provider practices.

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