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Racial Differences in Pelvic Organ Prolapse

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Abstract

OBJECTIVE—To compare the estimated prevalence of, risk factors for, and level of bother associated with subjectively reported and objectively measured pelvic organ prolapse in a racially diverse cohort.

METHODS—The Reproductive Risks for Incontinence Study at Kaiser 2 is a population-based cohort study of 2,270 middle-aged and older women. Symptomatic prolapse was self-reported, and bother was assessed on a five-point scale. In 1,137 women, prolapse was measured with the Pelvic Organ Prolapse Quantification (POP-Q) system. Multivariable logistic regression analysis was used to identify the independent association of prolapse and race while controlling for risk factors.

RESULTS—The participants' mean (standard deviation) age was 55 (9) years, and 44% were white, 20% were African American, 18% were Asian American, and 18% were Latina or other race. Seventy-four women (3%) reported symptomatic prolapse. In multivariable analysis, the risk of symptomatic prolapse was higher in white (prevalence ratio 5.35, 95% confidence interval [CI] 1.89–15.12) and Latina (prevalence ratio 4.89, 95% CI 1.64–14.58) compared with African-American women. Race was not associated with report of moderate to severe bother. Degree of prolapse by POP-Q stage was similar across all racial groups; however, the risk of the leading edge of prolapse at or beyond the hymen was higher in white (prevalence ratio 1.40, 95% CI 1.02–1.92) compared with African-American women.

CONCLUSION—Compared with African-American women, Latina and white women had four to five times higher risk of symptomatic prolapse, and white women had 1.4-fold higher risk of objective prolapse with leading edge of prolapse at or beyond the hymen.

Pelvic organ prolapse (prolapse) is prevalent and associated with significant health-related quality of life and economic impact.^{1,2} However, there are few population-based studies estimating the prevalence of, risk factors for, and degree of bother associated with prolapse by major racial and ethnic groups.³ Studies that compare the prevalence of prolapse across racial groups have been limited to white and African-American women,^{4,5} and the few studies

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evaluating prolapse in racially diverse cohorts have been unable to examine subjectively reported and objectively measured prolapse simultaneously.^{3,6}

Ascertaining the prevalence of both subjectively reported and objectively measured prolapse across racial and ethnic groups is necessary to more fully understand the impact of prolapse. Therefore, our primary objectives were to compare the estimated prevalence of, risk factors for, and level of bother associated with subjectively reported and objectively measured prolapse in a racially diverse cohort of women.

MATERIALS AND METHODS

The Reproductive Risks for Incontinence Study at Kaiser is an ethnically diverse, population-based longitudinal cohort study of 2,270 randomly selected middle-aged and older women. The current study reports on data collected for community-dwelling women between June 2003 and January 2008 at the second Reproductive Risks for Incontinence Study at Kaiser visit, when data on subjective and objective pelvic organ prolapse were collected. At baseline (1999–2002), the first Reproductive Risks for Incontinence Study at Kaiser visit population was created by identifying women between 40 and 69 years of age who, since age 18 years, had been members of the Kaiser Permanente Medical Care Program of Northern California, a large integrated health care delivery system with more than three million members that serves approximately 25% of the population in the area. Although previous studies have found Kaiser Permanente Medical Care Program of Northern California members to underrepresent extremes in economic status and to be slightly more educated, members have been shown to be similar to the population in the geographic area served with respect to all other demographic characteristics.⁷ Eligibility included having at least half of all births at Kaiser. Details of the Reproductive Risks for Incontinence Study at Kaiser have been reported previously.⁸ The institutional review boards of the University of California, San Francisco and the Kaiser Foundation Research Institute approved this study. Informed consent was obtained.

Data on symptomatic prolapse was ascertained by a self-report questionnaire. The questions were modified from those used in previous epidemiologic studies and found to be the most specific and to have the highest positive predictive value for prolapse at or beyond the hymen on examination.⁹ Symptomatic prolapse was defined as affirmative answer to either 1) “During the past 3 months, have your pelvic organs (uterus, bladder, rectum) been dropping out of your vagina, causing a feeling of bulging, pressure, or protrusion or a sensation like your ‘insides are coming out’? (This is sometimes called prolapse)” or 2) “During the past 3 months, have you had a bulge from your vagina or something falling out of your vagina that you can see or touch?” Women responding yes to either question were identified as having symptomatic prolapse. Women who were told by their doctor that they had prolapse or who reported symptomatic prolapse were asked, “During the past 3 months, how much has your prolapse bothered you?” with response options of not at all, slightly, moderately, quite a bit, and extremely. Data from 2,270 women were available for analysis. A subset of 1,137 women volunteered to undergo physical examination including pelvic organ prolapse quantification (POP-Q) examination by a trained nurse practitioner.

Factors potentially associated with prolapse were assessed by self-report questionnaire, interview, and medical record review, including questions on demographic characteristics, race/ethnicity, reproductive and menopause history, presence of selected medical conditions, prior pelvic and other surgeries, general health status, and sexual function. Race/ethnicity was elicited by response to the question “What is your ethnic background?” and was categorized as white, African American, Latina, Native American, Asian, or other. Body mass index (BMI) was calculated based on the participant’s weight and height measured at the time of the interview (kg/m^2). Mode of delivery (vaginal or cesarean delivery) and other delivery

parameters, such as birth weight and duration of second stage of labor, were abstracted from review of labor and delivery and surgical medical records archived since 1946 or self-reported. Other pelvic floor disorders, including urinary incontinence and flatal and fecal (including mucous, liquid, and solid stool) incontinence, were assessed by self-report. Women were considered to have these conditions if they reported weekly or greater urinary or flatal incontinence and monthly or greater fecal incontinence, because these frequencies have been observed to have substantial impact on daily activities.^{10,11}

To estimate the independent association of previously identified risk factors for symptomatic prolapse, POP-Q stage II or greater, and leading edge of prolapse greater than or equal to the hymeneal ring (points Aa, Ba, Ap, Bp, and C≥0), we ran separate logistic regression models including variables that were significant ($P<.2$) in univariable analysis that remained significant after adjustment in the multivariable model. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were reported. Tests for trend were based on orthogonal linear contrasts in the log OR across the ordinal categories. P values in multivariable models were based on tests for pair-wise comparisons for dichotomous variables, tests for heterogeneity for nominal variables, and tests for linear trend for ordinal variables. Tests of heterogeneity were from the Wald (type 3) χ^2 test in logistic regression models. The Spearman rank correlation coefficient was used to test the correlation between bother and POP-Q stage.

When the prevalence of an outcome is uncommon, the OR is a good estimate of the relative risk in cohort studies. Two of our study outcomes, stage II or greater prolapse and prolapse at or below the hymen, were present in more than 20% of participants for some subsets of our study population. For these two outcomes, we estimated the prevalence ratio and 95% CI using a modified Poisson regression analysis with robust error variance.¹² Logistic regression analyses were used to evaluate the increased risk for bother from prolapse based on POP-Q stage. All analyses were performed using SAS 9.2 (SAS Institute, Cary, NC).

For symptomatic prolapse, the sample of at least 800 white women compared with other racial groups of at least 400 women provided 80% power in two-sided tests with a type 1 error of 5% to detect failure rates of 4.3% and 1.4% among whites compared with another racial group, respectively. For stage II or greater prolapse, the sample of at least 300 white women compared with other racial groups of at least 150 women provided 80% power in two-sided tests with a type 1 error of 5% to detect failure rates of 67.8% and 54.2% among whites compared with another racial group, respectively.¹³

RESULTS

Among the 2,270 women, the mean (standard deviation) age was 55 (9) years, and participants were racially diverse (44% white, 20% African American, 18% Asian American, and 18% Latina or other race). The characteristics of the entire Reproductive Risks for Incontinence Study at Kaiser cohort, as well as those with and without POP-Q examinations, are shown in Table 1. Women receiving the POP-Q were generally similar to the entire cohort with respect to age (55.4 compared with 55.0 years) and to the prevalence of demographic and medical characteristics (within 5%), with the exception of race, with white women composing a larger proportion of POP-Q participants (50% compared with 44%).

Seventy-four women (3%, 95% CI 2.5–4.0%) reported symptoms of prolapse in the previous 3 months (Table 2). The prevalence of symptomatic prolapse varied by race ethnicity, from 1% of African-American women to 5% of Latina women ($P=.002$). Among these women, 61 (82%) reported a feeling of bulging, pressure, or protrusion from the vagina, 46 (62%) reported visible bulging or protrusion from the vagina, and 33 (45%) reported both symptoms. There was a trend toward increasing degree of bother in Latina women compared with other racial

groups, with 41% of Latina women reporting moderate to extreme bother compared with 20% of white women, 20% of Asian women, and 17% of African-American women; however, the test for heterogeneity did not reach statistical significance ($P=.10$; Latina women compared with African-American women: OR 3.4, 95% CI 0.6–18.2).

Degree of prolapse by POP-Q stage was similar across all racial groups (stage 0: 6–8%, stage I: 24–29%, stage II: 64–69%, and stage III or greater: 0–1%; $P=.84$; Table 2). Sixty-six percent of women who underwent physical examination had stage II prolapse, with 23% of those having the leading edge of prolapse 0 cm or more from the hymen. Report of moderate to extreme bother increased with POP-Q stage and was reported by 10% of women with stage 0 or I, 26% of women with stage II, 75% of women with stage III, and 100% of women with stage IV prolapse (Spearman correlation coefficient=0.36; $P=.001$).

Factors independently associated with symptomatic prolapse in multivariable analyses were white and Latina race compared with African-American race and less than college level of education (Table 3). Factors independently associated with the leading edge of prolapse at or beyond the hymen were white race compared with African-American race, age, BMI, and vaginal delivery. Factors independently associated with POP-Q stage II or greater were age, BMI, diabetes mellitus, and vaginal delivery.

DISCUSSION

In this diverse, population-based cohort, we found significant differences in the prevalence of symptomatic prolapse, with white and Latina women having the highest prevalence, followed by Asian and African-American women. After adjustment for multiple risk factors, Latina and white women had four to five times the risk of symptomatic prolapse, and white women had 40% higher risk of objective prolapse with the leading edge of prolapse at or beyond the hymen, compared with African-American women.

The 3% prevalence of symptomatic prolapse observed in our study is similar to that reported in another population-based study in the United States¹⁴ but less than the 6–8% prevalence rate reported by others^{15–17}; this may be attributable to our identification of prolapse symptoms in “the past 3 months,” whereas others have asked about the presence of symptoms “ever.”^{15,16} Similarly, our findings that stage II or greater prolapse is common and observed in 63–69% of women is consistent with other studies that report prevalence in the range of 30–98%.^{18,19} The majority of women with prolapse at or beyond the hymen (82%) had prolapse at the hymen, also likely responsible for the lower prevalence of symptomatic prolapse in our study.

There are few studies addressing the association of race/ethnicity and both subjectively reported and objectively measured prolapse, or its associated degree of bother. In the present adjusted analyses, we found a higher prevalence of symptomatic prolapse in white and Latina women compared with African-American women, and a higher prevalence of objective prolapse as defined by the leading edge at or beyond the hymen in white compared with African-American women. These findings confirm those of the Women’s Health Initiative trials in which African-American race was a protective factor for objectively measured prolapse. However, in our study we found that white rather than Hispanic race was a risk factor for objectively measured prolapse.¹⁸ We were also unable to confirm prior findings of an independent correlation of Asian race and higher rates of subjectively reported or objectively measured prolapse.⁶ Our findings are inconsistent with other studies observing no racial differences in the presence or severity of objectively measured prolapse in African-American and white women.^{4,5} These discrepant findings are likely attributable to differences in the populations studied and to how the subjective or objective outcome measures are defined, much

as the conclusions drawn from our own study vary according to the definition of objective prolapse used. When we defined objective prolapse as stage II or greater, no racial/ethnic differences were found; however, when we analyzed the leading edge of prolapse at or beyond the hymen, racial differences emerged.

The present findings of higher self-reported prolapse symptoms in white and Latina women compared with other racial groups, even in the setting of similar POP-Q stages, confirms those of others who have found a discrepancy between subjectively reported and objectively measured prolapse; although the presenting symptoms differ between racial/ethnic groups, the diagnosis of prolapse was similar across groups after examination.^{5,20} The findings of increased symptoms in white and Latina women, despite similar POP-Q stages, suggest that the racial disparity in prevalence of subjective prolapse may be in part attributable to cultural attitudes toward the symptomatology of prolapse or its reporting. An analogous relationship between race/ethnicity and urinary incontinence has been reported.^{8,21} Alternatively, the difference may again be attributable to the definitions of objective prolapse used, because it seems that the leading edge of prolapse at or beyond the hymen may better approximate symptoms than prolapse stage alone. The clinical and demographic characteristics of the entire study cohort and the subset that underwent physical examination were similar, thereby minimizing any bias introduced by subjective and objective findings on fundamentally different groups. Although the etiology of the differences in prevalence of pelvic floor disorders between racial and ethnic groups has not been identified, physiological, behavioral, and reporting differences have been suggested as explanations.^{8,22,23} The degree to which these correlations between symptoms, bother, and POP-Q stage are consistently observed across major racial and ethnic groups remains largely unexamined in the literature and merits future study in larger, racially diverse cohorts of symptomatic women.

Whereas Latina and white race were independent risk factors for subjectively reported symptomatic prolapse in multivariable analysis, additional risk factors not associated with symptomatic prolapse were associated with objectively measured prolapse, including an association with age, BMI, and diabetes mellitus. In contrast, with the same set of covariates, the only racial/ethnic variation observed was when prolapse was defined as the leading edge at or beyond the hymen. One possible explanation for the difference in risk factors between subjective and objective measures is that with each outcome we are measuring a separate phenomenon, eg, the impact of cultural attitudes toward symptomatology or reporting differences with subjective measures not captured by objective measures. Because symptoms may be underestimated or overestimated as a function of race/ethnicity, the combination of subjective measures and leading edge of prolapse at or beyond the hymen may provide the most clinically relevant outcomes. As such, the inclusion of both subjective and objective measures in studies of prolapse seems to be important for understanding its impact, particularly in racially diverse cohorts.

The strengths of this study include its large, racially and ethnically diverse population-representative cohort; detailed measurement of potential risk factors and important covariables by medical record abstraction, interview, and linkage to inpatient and outpatient databases; and the use of both subjective and objective outcome measures. Symptomatic prolapse was defined by self-report with confirmation by examination and POP-Q in a large subset of women, thereby allowing us to better delineate whether the reported differences in prolapse are due to actual objective differences in its prevalence or to differences in symptomatology or reporting among various ethnic groups. The limitations of the present study include those inherent to any cross-sectional analysis. The participants were middle-aged and older community-dwelling volunteers with long-term enrollment in a prepaid health delivery system with generally equal access to care. Therefore, these results may not be generalizable to younger or older women, or to those with extremes of income or an uninsured population. In addition,

despite that we had POP-Q examinations for more than one thousand women, only 74 women reported symptomatic prolapse. This limits our power to detect risk factors for subjective prolapse in multivariable models. Women not participating in the POP-Q examination were significantly different from those with an examination with respect to the prevalence of several characteristics, although the magnitude of this difference was relatively small (less than 5%) except for nonparticipants being less likely to be menopausal (67% compared with 77%) or white (39% compared with 50%). In addition, women without a POP-Q examination were slightly younger and were less often white and more often of Asian ethnicity than women with POP-Q examinations. They also seemed to have higher annual income, as well as several other more favorable health outcomes, than those without an examination. However, analyses of risk factors are relatively robust against selection bias, and we do not think that our risk estimates are influenced by the differences between the two groups. The present study should not be interpreted as a validation study of one subjective and two objective measures of prolapse. Finally, there are limitations inherent to any self-identification of race, and that classification process invariably will mix some races.

In conclusion, although the prevalence of self-reported symptomatic prolapse was nearly fivefold higher for white and Latina women compared with African-American women, the degree of prolapse by POP-Q stage II or greater was similar across all racial groups. However, when the objective measure of prolapse was defined by the leading edge of prolapse at or beyond the hymen, white women had a 40% higher risk of prolapse compared with African-American women. These findings suggest that the addition of self-reported measures to the objective measure of prolapse at or beyond the hymen may provide clinically relevant outcomes in studies using the POP-Q system, particularly in racially diverse cohorts. The identification of ethnic/racial differences in prolapse may lead to a better understanding of its etiology and will inform future study in high-risk populations.

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Table 1

Characteristics of the Reproductive Risks for Incontinence Study at Kaiser 2 Cohort and the Subset With and Without Pelvic Organ Prolapse Quantification Examination

Characteristic	RRISK 2 Cohort (n=2,270)	POP-Q Participants (n=1,137)	Missing POP-Q	P*
Age (y)	55.0±9	55.4±9	54.6±10	.02
Race/Ethnicity				<.01
White	1,006 (44)	569 (50)	437 (39)	
African American	443 (20)	209 (18)	234 (21)	
Asian	401 (18)	159 (14)	242 (21)	
Latina/Hispanic/Native American/other	419 (18)	199 (18)	220 (19)	
College graduate	809 (36)	389 (34)	420 (37)	.16
Full-time job	999 (45)	475 (43)	524 (47)	.05
Annual household income				.04
Less than \$60,000	890 (42)	474 (44)	416 (40)	
\$60,000 or more	1,244 (58)	607 (56)	637 (60)	
Health				<.01
Excellent	268 (12)	102 (9)	166 (15)	
Very good	797 (35)	395 (35)	402 (36)	
Good	993 (44)	532 (47)	461 (41)	
Fair/Poor	211 (9)	108 (9)	103 (9)	
COPD, chronic bronchitis, or emphysema	76 (3)	52 (5)	24 (2)	<.01
Constipation monthly or more	478 (21)	255 (22)	223 (20)	.11
IBS	208 (9)	114 (10)	94 (8)	.16
Antibiotic therapy for UTI in the past year	319 (14)	167 (15)	152 (13)	.38
Prior hysterectomy	533 (23)	297 (26)	236 (21)	<.01
Menopausal	1,634 (72)	877 (77)	757 (67)	<.01
Current smoking	171 (8)	86 (8)	85 (8)	.96
Urinary incontinence weekly or more	610 (27)	349 (31)	261 (23)	.04
Urinary incontinence monthly or more	506 (22)	301 (26)	205 (18)	<.01
Symptomatic prolapse	74 (3)	43 (4)	31 (3)	.16

RRISK, Reproductive Risks for Incontinence Study at Kaiser; POP-Q, pelvic organ prolapse quantification; SD, standard deviation; COPD, chronic obstructive pulmonary disease; IBS, irritable bowel syndrome; UTI, urinary tract infection.

Data are mean±SD or n (%) unless otherwise specified.

* P for χ^2 test for difference between women with and without POP-Q examination.

Women Self-reporting Symptomatic Pelvic Organ Prolapse, Associated Bother, and Pelvic Organ Prolapse Quantification Stage by Self-identified Race or Ethnicity

Table 2

Prolapse Variable	Overall	White	African American	Asian	Latina	P*
n	2,269	1,006	443	401	419	
Symptomatic prolapse [†]	74	43	5	7	19	.00
Bother from prolapse	141	82	12	15	32	
Any bother	78 (55)	47 (57)	6 (50)	5 (33)	20 (63)	.28
Moderate to extreme bother	34 (24)	16 (20)	2 (17)	3 (20)	13 (41)	.10
POP-Q examination [‡]	1,136	569	209	159	200	
0 cm or more from hymen	257 (23)	144 (25)	39 (19)	34 (21)	40 (20)	.17
Stage 0	76 (7)	37 (7)	15 (7)	9 (6)	15 (8)	.89
Stage I	298 (26)	146 (26)	59 (28)	46 (29)	47 (24)	.61
Stage II	754 (66)	379 (67)	134 (64)	104 (65)	137 (69)	.78
Stage III	7 (<1)	6 (1)	1 (0)	0 (0)	1 (1)	.43
Stage IV	1 (<1)	1 (0)	0 (0)	0 (0)	0 (0)	1.00

POP-Q, pelvic organ prolapse quantification.

Data are n (%) unless otherwise specified.

* P from χ^2 test for heterogeneity.

[†] P=.002, percentage of women in each racial group reporting symptomatic prolapse.

[‡] P<.001, percentage of women in each racial group with POP-Q examination.

Table 3

Multivariable Analysis of Factors Independently Associated With Symptomatic Prolapse, Leading Edge of Prolapse 0 cm or More From the Hymen, and Pelvic Organ Prolapse Quantification Stage II or Greater

Characteristic	All RRISK 2 Women Symptomatic Prolapse						Women With POP-Q Examination					
	Leading Edge of Prolapse at or Below the Hymen			POP-Q Stage II or Greater			Leading Edge of Prolapse at or Below the Hymen			POP-Q Stage II or Greater		
	PR (95% CI)	P*	P†	PR (95% CI)	P*	P†	PR (95% CI)	P*	P†	PR (95% CI)	P*	P†
Per 10 y	1.22 (0.94–1.59)	.13	.13	1.20 (1.06–1.35)	.004	.004	1.03 (1.01–1.05)	.001	.001	1.03 (1.01–1.05)	.001	.001
Race			.01						.11			.45
African American	Reference			Reference			Reference		.10	Reference		
White	5.35 (1.89–15.12)	.002		1.40 (1.02–1.92)	.04		1.04 (0.99–1.08)	.12		1.04 (0.99–1.08)	.12	
Asian	2.56 (0.73–9.08)	.14		1.40 (0.93–2.12)	.14		1.04 (0.98–1.10)	.21		1.04 (0.98–1.10)	.21	
Latina or other	4.89 (1.64–14.58)	.004		1.10 (0.74–1.63)	.63		1.03 (0.98–1.08)	.31		1.03 (0.98–1.08)	.31	
No college	1.94 (1.05–3.58)	.03		0.99 (0.78–1.25)	.93	.93	1.01 (0.98–1.05)	.49	.49	1.01 (0.98–1.05)	.49	.49
BMI (kg/m ²)			.93‡						.001‡			<.001‡
Less than 25	Reference			Reference			Reference			Reference		
25 to less than 30	1.03 (0.53–2.00)	.93		1.46 (1.05–2.02)	.02		1.06 (1.01–1.11)	.01		1.06 (1.01–1.11)	.01	
30 or greater	1.43 (0.76–2.68)	.27		1.67 (1.22–2.29)	.001		1.09 (1.04–1.14)	<.001	<.001	1.09 (1.04–1.14)	<.001	<.001
Parity			.07									
Nulliparous	Reference			Reference			Reference			Reference		
Cesarean delivery only	0.38 (0.05–3.21)	.37		1.31 (0.65–2.62)	.45		1.09 (1.01–1.18)	.03		1.09 (1.01–1.18)	.03	
One or more vaginal deliveries	2.10 (0.88–5.02)	.09		2.44 (1.56–3.81)	<.001		1.14 (1.08–1.20)	<.001		1.14 (1.08–1.20)	<.001	<.001
Diabetes	1.35 (0.77–2.38)	.29	.29	1.18 (0.94–1.49)	.14	.15	1.10 (1.06–1.14)	<.001	<.001	1.10 (1.06–1.14)	<.001	<.001

RRISK, Reproductive Risks for Incontinence Study at Kaiser; POP-Q, pelvic organ prolapse quantification; PR, prevalence ratio; CI, confidence interval; BMI, body mass index.

* P from pair-wise comparison.

† P from χ^2 test of heterogeneity.

‡ P from χ^2 test for trend.