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The incidence of urinary incontinence across Asian, black, and white women in the United States

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Abstract

Objective—We calculated incidence rates of urinary incontinence by incontinence frequency and type over 4 years in Asian, black, and white women in the United States.

Study Design—Prospective analyses included 76,724 participants aged 37–79 years in the Nurses' Health Study cohorts with no incontinence at baseline.

Results—The 4-year incidence of incontinence at least monthly was higher in white women (7.3/100 person-years) compared with Asian (5.7/100 person-years, p=0.003) and black women (4.8/100 person-years, p<0.001). The incidence of at least weekly stress incontinence was significantly lower in black compared with white women (0.1 versus 0.8 per 100 person-years, p<0.001). The difference between black and white women in the incidence of any incontinence and stress incontinence remained significant after adjusting for known risk factors (p<0.001 for both).

Conclusions—Urinary incontinence incidence differs by race. Studies to confirm these results and better understand underlying mechanisms are needed.

Keywords

epidemiology; incidence; race; urinary incontinence

INTRODUCTION

Growing scientific evidence indicates that the burden of urinary incontinence (UI) may vary across racial groups. Several cross-sectional studies[1–7], including our own[8, 9], have reported a lower prevalence of overall incontinence in black and Asian women compared with white women, and cross-sectional studies have consistently found a higher prevalence of stress

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incontinence in white versus black women[2–4, 6, 10, 11]. In addition, biologic data suggest that differences in pelvic floor anatomy between white and black women may explain differences in UI prevalence.[12]

However, because prevalence is a function of both incidence and duration of incontinence, these differences in prevalence may or may not reflect incontinence incidence. Better characterization of racial variations in incontinence incidence could help further understanding of the natural history and etiology of incontinence and incontinence types. However, few prospective studies have examined incontinence incidence in different racial groups and, among the limited studies[3, 13], only one[3] collected data on incontinence type. Thus, we examined incontinence incidence rates, by incontinence frequency and type, in Asian, black, and white female health professionals enrolled in two large U.S. prospective cohort studies, the Nurses' Health Study (NHS) and the NHSII.

MATERIALS AND METHODS

The Nurses' Health Studies

The NHS was initiated in 1976 when 121,700 female nurses aged 30–55 years completed a mailed questionnaire about their medical history and health behaviors. [14] In 1989, the NHSII was established when 116,430 female nurses aged 25–42 years returned a similar mailed questionnaire. Return of the questionnaire implied informed consent. Updated information on participants is obtained using biennial questionnaires. During each questionnaire cycle, a full-length questionnaire is sent for initial mailings, after which an abbreviated version is sent to non-responders to maximize participation. The Institutional Review Board of Brigham and Women's Hospital approved these studies.

Study population

Questions about urinary incontinence were included on the full-length questionnaires mailed in 2000, 2002, and 2004 in the NHS and 2001, 2003, and 2005 in the NHSII. In the NHS, 83,996 women answered the incontinence questions on the 2000 questionnaire. Responders were identical to the entire NHS cohort in mean age, mean body mass index (BMI), and parity. In addition, the racial distribution of responders was very similar to the entire cohort (0.7% versus 0.8% Asian; 1.2% versus 1.5% black; 94% versus 92% white, respectively). In the NHSII, responders to the incontinence questions in 2001 (n=85,503) were identical to the entire NHSII cohort in mean age and BMI and highly similar to the entire cohort in parity (18% versus 15% nulliparous, respectively) and racial distribution (95% versus 94% white; 1.4% versus 1.8% black; 1.3% versus 1.7% Asian, respectively).

For these analyses, we defined baseline as 2000 in the NHS and 2001 in the NHSII. In each cohort we excluded prevalent cases of incontinence at least once per month or incontinence of more than a few drops less than once per month at baseline (NHS n=40,807; NHSII n=43,923). In addition, we excluded women missing incontinence information on both the first and second follow-up questionnaires (NHS n=2,920; NHSII n=2,848); women missing information on race (NHS n=430; NHSII n=47); and women who self-identified as two or more races or as a race other than Asian, black, or white (NHS n=1,047; NHSII n=753). Thus, analyses included 76,724 women (NHS n=38,792; NHSII n=37,932), or 94% of all Asian, black, or white women who were at risk for incident incontinence at baseline and received at least one follow-up questionnaire.

Measurement of urinary incontinence

Participants in the NHS and NHSII were asked on the baseline and follow-up questionnaires, "During the last 12 months, how often have you leaked or lost control of your urine?" Response

options were never, less than once per month, once per month, 2–3 times per month, about once per week, and almost every day. In reliability testing, response to this question was highly reproducible among these nurses.[8]

Incident incontinence during follow-up was defined as incontinence occurring at least once per month. Among incident cases, occasional incontinence was defined as incontinence occurring 1–3 times per month and frequent incontinence was defined as incontinence occurring at least once per week.

Measurement of urinary incontinence type

We believed that women with at least weekly incontinence were likely better able to describe the precipitants of their incontinence than women with less frequent incontinence. Therefore, we defined incontinence type only among cases with frequent incontinence. At the first follow-up, incontinence type was assessed on a supplementary questionnaire mailed to women with frequent incontinence.[15] Due to the large number of incident cases with frequent incontinence in the NHS, the supplementary questionnaire was mailed to a random sample of 80% of the cases (n=2,171) and completed by 84% of these. In the NHSII, the same supplementary questionnaire was mailed to 98% of cases (n=1,222; 19 cases identified late in the questionnaire cycle did not receive a questionnaire) and completed by 79%. Important incontinence risk factors, including mean age, mean BMI, parity, and the racial distribution were similar in incident cases with frequent incontinence who did and those who did not provide incontinence type information. For the second follow-up period, data on incontinence type were collected directly from the main questionnaire, and thus information on incontinence type was available from 99% of women with frequent incontinence.

Stress incontinence was defined as leaking primarily with coughing or sneezing, lifting things, laughing, brisk walking or exercise. Urgency incontinence was defined as primarily leaking accompanied by an urge to urinate or a sudden feeling of bladder fullness. Incontinence type was classified as mixed when women reported that stress and urgency incontinence symptoms were equally common. Incontinence type was classified as “other” when leaking occurred in circumstances other than those described above.

Measurement of race

Women were asked to indicate their race and ethnicity on the NHS and NHSII questionnaires. We classified women as Asian, black, or white if they marked their race as only Asian, only black or African American, or only white, respectively. Women of both Hispanic and non-Hispanic ethnicity were included within each racial category (only 1% of women reported Hispanic ethnicity).

Statistical analysis

We calculated race-specific incontinence incidence rates and their 95% confidence intervals (CIs) by incontinence frequency (any, occasional, frequent) and incontinence type (stress, urgency, mixed). Because we allowed women missing incontinence information on either the first or second follow-up questionnaire (but not both) to remain in the study population, we calculated incidence rates using observed person-years of follow-up. This method allowed us to account for changes in follow-up status and take advantage of all available data, as opposed to cumulative incidence proportions, which assume a uniform population throughout the study period.[16] Thus, for example, a woman at risk for incident incontinence at baseline who reported no incontinence at follow-up 1 and was missing incontinence information at follow-up 2 contributed person-time during the first follow-up period only. Race-specific incidence rates per 100 person-years were obtained by dividing the total number of incident cases over the 4-

year follow-up period by the total observed person-years and multiplying by 100 within each racial category.

We used the score statistic to test whether rates of incontinence in black and Asian women were significantly different from rates in white women.[16] To assess associations between race and incontinence incidence adjusting for potential confounding factors, we used Cox proportional hazards models, controlled for age in months, to calculate multivariable-adjusted hazard ratios (HRs) and 95% CIs.[17] For these analyses, we excluded 2,007 women missing information on BMI or parity, since these are such important covariates. In addition to age, all multivariable models included the following covariates, identified as incontinence risk factors in previous studies among these women[9, 18, 19]: BMI (continuous), parity (0, 1–2, 3+ births), cigarette smoking (never, past, current), physical activity (metabolic equivalent hours/week, continuous), type 2 diabetes, and postmenopausal hormone use (premenopausal, postmenopausal – never user, past user, current user, unknown hormone use status). Additional control for hypertension, diuretic use, hysterectomy, major neurologic disease (defined as stroke, multiple sclerosis, or Parkinson's disease), and functional limitation (defined as a significant limitation in climbing 1 flight of stairs, walking 1 block, bathing, or dressing) did not affect the HRs and thus were not included in models. All covariates were updated to reflect participant status as of the beginning of each 2-year risk period.

We also conducted a secondary analysis among the subset of women with UI data at both follow-up periods (n=10,850) to explore potential racial differences in the persistence of incontinence at the second follow-up among women with incident UI at follow-up 1. For this analysis, we used the chi-square test to compare the proportion of Asian or black versus white women with persistent incident UI.

RESULTS

Baseline characteristics

In 2000, the NHS participants were aged 54–79 years and, in 2001, the NHSII participants were aged 37–54 years. In both cohorts, Asian women had the lowest mean BMI and black women were the most likely to have been diagnosed with type 2 diabetes (Table 1). White women were the most likely to be current smokers.

Incidence rates by incontinence frequency

When considering each cohort separately over the 4-year follow-up period, we found that patterns of incontinence rates across racial groups were similar (Table 2), despite the age differences between the cohorts. Specifically, rates of incontinence were generally highest in white women and lowest in black women. In the combined cohorts, compared with white women, rates of incontinence at least monthly were significantly lower in Asian ($p=0.003$) and black women ($p<0.001$). When considering separately those with occasional (1–3 times/month) and frequent (at least weekly) incontinence, rates of occasional incontinence were significantly lower in Asian ($p=0.01$) and black women ($p<0.001$) compared with white women. Rates of frequent incontinence were significantly lower in black ($p=0.002$), but not Asian women ($p=0.2$), compared with white women.

To assess whether differences in risk factors across races might explain these differences in UI rates, we controlled for several UI risk factors. In the combined cohorts, rates of incontinence overall, as well as both occasional and frequent incontinence, remained significantly lower in black compared with white women after multivariable adjustment. For example, the multivariable-adjusted HRs comparing black women to white women were 0.55 (95% CI 0.47–0.64) for any incontinence, 0.56 (95% CI 0.47–0.68) for occasional

incontinence, and 0.52 (95% CI 0.39–0.68) for frequent incontinence. The multivariable-adjusted HR comparing Asian women to white women was borderline significant for any incontinence (HR 0.86, 95% CI 0.73–1.01) and statistically significant for occasional incontinence (HR 0.80, 95% CI 0.66–0.98).

In a secondary analysis to explore potential differences in the persistence of incident incontinence across races, results were similar to those in the primary analysis (data not shown in table). Specifically, 59% of white women with incident UI at follow-up 1 continued to report incontinence at follow-up 2 compared with 49% of Asian women (p=0.09 versus white women) and 48% of black women (p=0.04 versus white women).

Incidence rates of frequent incontinence by incontinence type

Within each cohort, stress incontinence was the most common incontinence type among white and Asian women (Table 3). In contrast, urgency incontinence was the most common type among black women within each cohort. When we compared rates of specific incontinence types between racial groups, we found that the incidence rate of stress incontinence was significantly lower in black women compared with white women ($p<0.001$ in the combined cohorts). The incidence rates of stress, urgency, and mixed incontinence did not differ significantly between white and Asian women. In multivariable-adjusted analyses, the difference in stress incontinence incidence comparing black women to white women remained significant after adjusting for potential confounding factors (HR 0.15, 95% CI 0.06–0.35).

COMMENT

These data add to growing evidence from biologic and epidemiologic studies that risk of urinary incontinence varies by race. In our prospective study, the overall incidence of incontinence was significantly higher in white women compared with black women, and this difference could not be explained by differences in several health and lifestyle factors related to incontinence. Also, incontinence incidence appeared lower in Asian compared with white women. Finally, rates of stress incontinence were significantly higher in white versus black women, and, in contrast to white or Asian women, urgency incontinence was the most common type in black women.

Our study has several limitations. First, all incontinence information was self-reported. The accuracy of self-reported incontinence compared with clinically diagnosed incontinence has been established.[20] However, results of validation studies indicate that classification of incontinence by type is more vulnerable to misclassification.[21–23] We attempted to minimize this error by only considering incontinence type among women with at least weekly incontinence, who may be better able to identify the primary circumstances in which leaking occurs. In addition, in previous analyses in these cohorts, we observed expected relations between risk factors and specific incontinence types, suggesting that our classification method functions reasonably well.[24, 25]

Second, white women comprise over 90% of the NHS and NHSII cohorts. Consequently, our estimates regarding specific incontinence types among black and Asian women were based on smaller numbers and should be interpreted more cautiously.

Third, women of different ethnicities are included within each of our racial categories and it is possible that incidence rates among the different ethnicities are not homogeneous. However, only 1% of the participants reported they were Hispanic or Latina and we did not collect data on other ethnic groups.

Finally, our study population included health professionals with similar education, access to health care and health knowledge, which may reduce generalizability to broader populations of women. However, this homogeneity likely increases the internal validity of our findings; this may be particularly important if previous studies of racial differences in incontinence may have been biased by cultural differences in reporting of incontinence.

Reports of a smaller levator ani muscle[26, 27], smaller pelvic floor cross-sectional area[28], and lower urethral closure pressure[29, 30] in white compared with black women support our observation of higher incontinence incidence in general, and higher stress incontinence incidence in particular, in white women. Less is known regarding potential differences in pelvic floor function between Asian and non-Asian women. However, one study found lower residual volume, lower volume at strong desire to void, and lower cystometric capacity in 60 South Indian Asian compared with 247 white women.[31] Whether these differences might be related to differences in incontinence incidence is unclear and further research on pelvic floor structure and function in Asian women is needed.

Similar to our findings, the majority of cross-sectional studies have found a lower prevalence of incontinence in black women compared with white women, with adjusted odds ratios for any incontinence ranging from 0.3–0.5.[1–6, 8, 9, 32–34] In addition, several cross-sectional studies observed a 30% lower prevalence of at least weekly incontinence in Asian women compared with white women after multivariable adjustment.[2, 9] In a prospective analysis of 2,702 women aged 42–52 years in the SWAN study, after adjusting for potential confounding factors, the incidence of incontinence was not significantly different comparing Chinese or Japanese women with white women and, in contrast to our results, there was a non-significant increase in incontinence risk in black versus white women (OR 1.33, 95% CI 0.89–1.99).[3] However, in the SWAN study, women who remained in the cohort over the 5-year follow-up period were less likely to be black and more likely to report incontinence than those who dropped out, which could have led to an overestimation of incontinence incidence in black women.

Prevalence studies of incontinence type, including those with urodynamic data, have consistently found a lower prevalence of stress incontinence in black versus white women, with multivariable-adjusted odds ratios for any incontinence ranging from 0.3–0.6.[2–4, 6, 10, 11, 29, 35, 36] In the prospective SWAN study, the multivariable-adjusted odds of incident stress incontinence was 56% lower in black versus white women (OR 0.44, 95% CI 0.28–0.68), [3] similar to our findings.

For urgency incontinence, results from cross-sectional studies that have examined differences between black and white women in general populations have not been consistent, with studies reporting a higher prevalence in black women[6, 10], a lower prevalence in black women[4], and no difference in prevalence[2, 3]. In the SWAN study, the cumulative incidence of urgency incontinence was significantly higher in black versus white women after adjusting for potential confounders (OR 1.91, 95% CI 1.22–2.99).[3] Because urgency incontinence is generally less common than stress or mixed incontinence among younger women[21], smaller case numbers, and thus less precise estimates, may contribute to discrepant findings across studies.

Of the few cross-sectional studies that have examined incontinence type in Asian women, several have observed a similar pattern in the frequency of specific incontinence types among Asian women as our study. For example, among 66 Asian women (mean age 55 years) who underwent urodynamic testing, genuine stress incontinence was the most common diagnosis (genuine stress incontinence 56%, detrusor instability 14%, mixed incontinence 12%) and the frequencies of all incontinence types were similar to those in white women.[35] Similar to our results, in the SWAN study, stress incontinence was the most common incontinence type in

Chinese and Japanese women and the incidence of stress incontinence was similar to that in white women for both Chinese and Japanese women.[3] In contrast to our results, the incidence of urgency incontinence in the SWAN study was significantly lower in Chinese (OR 0.22, 95% CI 0.07–0.72) and Japanese women (OR 0.37, 95% CI 0.14–0.97) than in white women after multivariable adjustment. Clearly additional prospective studies, and particularly those with data in Asian women, are needed to better understand racial differences in incontinence incidence.

In conclusion, our data indicate that the incidence of urinary incontinence varies among Asian, black, and white adult women. We found that white women were more likely to develop incontinence than black and Asian women and black women were less likely to develop stress incontinence than white women. Future prospective studies with data on pelvic floor structure and function may be useful to further explore these apparent racial differences in incontinence risk.

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Table 1

Characteristics of study participants at risk for incident urinary incontinence in 2000 (NHS) and 2001 (NHS II)

	NHS			NHS II		
Variable	**Asian (n=287)**	**Black (n=590)**	**White (n=37,915)**	**Asian (n=565)**	**Black (n=548)**	**White (n=36,819)**
Age, years (mean (SD))	66.1 (6.4)	65.9 (6.1)	65.5 (7.0)	46.7 (4.3)	47.2 (4.5)	46.0 (4.7)
Body mass index, kg/m^2 (mean (SD))[a]	23.5 (3.5)	28.4 (5.2)	26.0 (4.9)	23.3 (3.5)	29.4 (6.3)	25.6 (5.5)
Physical activity, MET-hrs/wk (mean (SD))	20.1 (18.2)	14.8 (14.2)	18.8 (17.3)	19.2 (21.1)	20.5 (26.1)	23.1 (22.4)
Parity (%)						
0	4.9	6.4	6.1	29.0	25.6	21.0
1–2	40.1	50.2	35.6	51.2	57.1	51.3
3+	49.1	40.5	56.9	17.4	16.4	26.8
Missing	5.9	2.9	1.4	2.5	0.9	1.0
Premenopausal (%)	0.7	0.9	1.3	74.9	61.3	72.2
Postmenopausal hormone use (%)[b]						
Never	21.8	30.6	26.1	26.1	23.1	17.1
Past	28.8	33.7	27.7	18.3	21.2	18.5
Current	43.9	22.9	40.5	47.9	41.5	60.7
Missing	5.6	12.8	5.7	7.8	14.2	3.7
Cigarette smoking (%)						
Never	67.9	53.6	44.6	89.9	74.5	66.3
Past	28.9	41.4	45.9	7.8	18.3	25.4
Current	3.1	5.1	9.5	2.3	7.3	8.3
Diabetes (%)	9.1	15.6	7.0	2.8	6.6	2.1

MET, metabolic equivalent; SD, standard deviation

[a] Body mass index is missing for 95 women in the NHS (1 Asian, 2 black, 92 white) and 343 women in the NHS II (7 Asian, 9 black, 327 white)

[b] Calculated among postmenopausal women only

Table 2

Unadjusted incidence rates of urinary incontinence over 4 years by incontinence frequency and race[a]

	Person-years	Any[b]		Occasional[b]		Frequent[b]	
Race		**Cases**	**IR (95% CI)**	**Cases**	**IR (95% CI)**	**Cases**	**IR (95% CI)**
NHS							
Asian	993	61	6.1 (4.6–7.7)[c]	41	4.1 (2.9–5.4)	20	2.0 (1.1–2.9)
Black	2,047	104	5.1 (4.1–6.1)[e]	70	3.4 (2.6–4.2)[e]	34	1. 7 (1.1–2.2)[d]
White	130,142	10,515	8.1 (7.9–8.2)	7,054	5.4 (5.3–5.5)	3,461	2.7 (2.6–2.7)
NHS II							
Asian	1,716	94	5.5 (4.4–6.6)	66	3.8 (2.9–4.8)[c]	28	1.6 (1.0–2.2)
Black	1,695	74	4.4 (3.4–5.4) [e]	56	3.3 (2.4–4.2)[d]	18	1.1 (0.6–1.6)
White	124,304	8,023	6.5 (6.3–6.6)	6,109	4.9 (4.8–5.0)	1,914	1.5 (1.5–1.6)
Combined							
Asian	2,709	155	5.7 (4.8–6.6)[d]	107	4.0 (3.2–4.7)[d]	48	1.8 (1.3–2.3)
Black	3,742	178	4.8 (4.1–5.5)[e]	126	3.4 (2.8–4.0)[e]	52	1.4 (1.0–1.8)[d]
White	254,446	18,538	7.3 (7.2–7.4)	13,163	5.2 (5.1–5.3)	5,375	2.1 (2.1–2.2)

[a] Incidence/100 person-years

[b] Any incontinence is defined as incontinence at least monthly. Occasional incontinence is defined as incontinence 1–3 times per month. Frequent incontinence is defined as incontinence at least weekly.

[c] Unadjusted incidence rate significantly different vs. white women: $0.01 \leq p < 0.05$

[d] Unadjusted incidence rate significantly different vs. white women: $0.001 \leq p < 0.01$

[e] Unadjusted incidence rate significantly different vs. white women: $p<0.001$

Table 3

Unadjusted incidence rates of frequent urinary incontinence over 4 years by incontinence type and race[a]

	Person-years	Stress		Urgency		Mixed	
Race		**Cases**	**IR (95% CI)**	**Cases**	**IR (95% CI)**	**Cases**	**IR (95% CI)**
NHS							
Asian	984	10	1.0 (0.4–1.6)	4	0.4 (0.1–1.0)	2	0.2 (0.0–0.7)
Black	2,031	2	0.1 (0.0–0.4)[c]	11	0.5 (0.2–0.9)	9	0.4 (0.2–0.8)
White	128,432	1,164	0.9 (0.9–1.0)	661	0.5 (0.5–0.6)	676	0.5 (0.5–0.6)
NHS II							
Asian	1,703	17	1.0 (0.5–1.5)	0	0.0 (0.0–0.2)	5	0.3 (0.1–0.7)
Black	1,689	3	0.2 (0.0–0.5)[b]	8	0.5 (0.2–0.9)	4	0.2 (0.1–0.6)
White	123,748	919	0.7 (0.7–0.8)	290	0.2 (0.2–0.3)	336	0.3 (0.2–0.3)
Combined							
Asian	2,687	27	1.0 (0.6–1.4)	4	0.1 (0.0–0.4)	7	0.3 (0.1–0.5)
Black	3,720	5	0.1 (0.0–0.3)[c]	19	0.5 (0.3–0.7)	13	0.3 (0.2–0.5)
White	252,180	2,083	0.8 (0.8–0.9)	951	0.4 (0.4–0.4)	1,012	0.4 (0.4–0.4)

[a] Incidence/100 person-years. Frequent incontinence is defined as incontinence at least weekly. Women with incident frequent incontinence with missing information on incontinence type or whose incontinence type was unclassifiable were excluded from these analyses.

[b] Unadjusted incidence rate significantly different vs. white women: $0.001 \leq p < 0.01$

[c] Unadjusted incidence rate significantly different vs. white women: $p < 0.001$