

Correlates of Urinary Symptom Scores in Men

ABSTRACT

Barbara E. K. Klein, MD, MPH, Ronald Klein, MD, MPH, Kristine E. Lee, MS, and Reginald C. Bruskwitz, MD

Objectives. This study determined the prevalence of urinary symptoms and their relationship to characteristics of a cohort of men in Beaver Dam, Wis, from 1993 to 1995.

Methods. A standardized questionnaire concerning urinary symptoms (the American Urological Association Urinary Symptom Questionnaire) was administered.

Results. All outcomes were associated with age and history of enlarged prostate. Urinary frequency (57%) and nocturia (65%) were the most common individual symptoms. Diuretic usage, diabetes, history of cardiovascular disease, and smoking were related to specific symptoms.

Conclusions. While urinary symptoms are associated with age and history of enlarged prostate, symptoms may also be attributable to other diseases and exposures. (*Am J Public Health*. 1999;89:1745-1748)

Quality of life¹ and health care-seeking behavior² are influenced by urinary symptoms. In adult men, symptoms related to urinary function are often attributed to benign prostatic hyperplasia (BPH). The American Urological Association has developed a symptom index as a tool to assess the degree of lower urinary tract symptoms in older men.³ While this instrument has been demonstrated to be reliable and discriminates between those with and without BPH, it describes urinary symptoms that are common and that may occur even in the absence of a clinical diagnosis of BPH. In addition, we hypothesize that, irrespective of BPH status, there are additional characteristics or exposures that add to the symptom burden. It was the purpose of this investigation to examine the relationships of some of these characteristics with the urinary symptoms in a group of adult men of a broad age range in a representative American community.

Methods

Population

Subjects included all males participating in the 5-year follow-up examination of the Beaver Dam Eye Study cohort.⁴ There were 2164 men who participated in the baseline examination from 1988 to 1990. Of these, 1612 men completed the 5-year follow-up, during which the American Urological Association symptom questionnaire was administered. Differences between participants and nonparticipants at baseline and follow-up have previously been published.^{5,6} In general, those who participated were little different from the targeted population.

Procedures

Tenets of the Declaration of Helsinki were followed, institutional human experimentation committee approval was granted, and informed consent was obtained at the beginning of the examination. Blood pressure was measured by the Hypertension Detection and Follow-Up Program protocol.⁷ Participants responded to an interview by trained examiners who followed written protocols. Subjects were asked (1) whether they had ever been told by their doctor that they had diabetes

and/or hypertension; (2) whether they had ever smoked (more than 100 cigarettes in their lifetime) and, if so, the number of cigarettes smoked per day and the number of months they smoked, current smoking status, and the date of stopping; (3) how much beer, wine, and/or liquor they consumed per week (the response was converted to grams of alcohol); and (4) whether they drank beverages with caffeine in them once per day or more often and, if so, how much (the amount ingested per day was calculated with estimates of the amount of caffeine per serving).⁸ The questionnaire included questions on prostate surgery, cardiovascular disease, and urinary tract and other cancers. All historical information was taken from responses to questions in a standardized interview and was not systematically confirmed by other sources. In addition, a series of questions was asked of the men regarding their prostate and urination problems (American Urological Association Urinary Symptom Questionnaire³).

Participants were asked about all medicines they were currently taking. The names of the drugs, but not dose or duration, were recorded.

Definitions

Diabetes was defined as a previous history of diabetes that was treated with either insulin, oral hypoglycemic agents, or diet, or a negative history of diabetes in the presence of elevated glycosylated hemoglobin.⁹ Pack-years were computed by dividing the number of cigarettes smoked per day by 20 and multiplying by the number of years smoked. Positive medication use (diuretics, antihypertensives) was defined as current use.

Overall symptom score was computed by adding responses to the 7 individual symptom questions, where "Not bothered at all" was coded as a 0 and "Always bothered" was coded as a 5. This score was then categorized into 2 groups: 0-7 and 8 or more. Responses to individual questions were also

Barbara E. K. Klein, Ronald Klein, and Kristine E. Lee are with the Department of Ophthalmology and Visual Sciences and Reginald C. Bruskwitz is with the Department of Surgery, University of Wisconsin Medical School, Madison.

This brief was accepted May 9, 1999.

TABLE 1—Odds Ratios (ORs) of Urinary Symptom Score by Various Personal Characteristics: Beaver Dam, Wis, 1993–1995

	No History of Enlarged Prostate					History of Enlarged Prostate				
	n	% With Symptoms ^a	OR ^b	95% CI ^b	P ^b	n	% With Symptoms	OR ^b	95% CI ^b	P ^b
Age, y										
48–59	520	11.7	1.00	...		45	44.4	1.00	...	
60–69	375	16.3	1.46	1.00, 2.14	.05	72	51.4	1.32	0.63, 2.79	.47
70–79	189	24.9	2.49	1.63, 3.81	.0001	54	50.0	1.25	0.57, 2.77	.58
80+	37	18.9	1.76	0.74, 4.17	.20	16	62.5	2.08	0.65, 6.72	.22
Systolic blood pressure, mm Hg										
≤139	835	15.7	1.00	...		132	52.3	1.00	...	
140–159	204	17.6	1.02	0.67, 1.54	.93	34	44.1	0.67	0.31, 1.45	.31
160+	63	14.3	0.77	0.37, 1.62	.49	17	41.2	0.55	0.19, 1.58	.27
Diastolic blood pressure, mm Hg										
≤89	977	16.2	1.00	...		158	50.0	1.00	...	
90–94	68	19.1	1.38	0.73, 2.61	.32	8	37.5	0.58	0.13, 2.53	.47
95+	57	8.8	0.55	0.22, 1.41	.22	17	52.9	1.14	0.42, 3.12	.80
Blood pressure medications										
No	774	14.0	1.00	...		107	51.4	1.00	...	
Yes	341	19.6	1.18	1.00, 1.40	.05	79	49.4	0.93	0.69, 1.25	.63
Diuretics										
No	947	13.6	1.00	...		154	50.6	1.00	...	
Yes	162	27.2	1.43	1.17, 1.75	.0006	31	45.2	0.84	0.56, 1.25	.38
Cardiovascular disease										
No	908	14.6	1.00	...		150	46.0	1.00	...	
Yes	208	19.2	1.12	0.75, 1.69	.58	37	67.6	2.35	1.08, 5.10	.03
Diabetes										
No	973	14.9	1.00	...		158	48.7	1.00	...	
Yes	100	24.0	1.27	0.99, 1.62	.07	20	60.0	1.25	0.78, 2.01	.35
Alcohol, g/wk										
None	437	16.7	1.00	...		85	58.8	1.00	...	
1–42	202	15.3	0.95	0.60, 1.52	.84	31	41.9	0.53	0.23, 1.25	.15
43–98	184	12.5	0.76	0.46, 1.26	.29	35	31.4	0.33	0.14, 0.77	.01
99+	295	16.3	1.03	0.69, 1.54	.89	35	54.3	0.88	0.39, 1.99	.75
Smoking										
Never	323	14.9	1.00	...		67	47.8	1.00	...	
Past	597	15.9	0.99	0.67, 1.45	.95	99	53.5	1.28	0.68, 2.38	.44
Current	201	16.4	1.16	0.71, 1.88	.56	21	42.9	0.87	0.32, 2.35	.78
Pack-years										
None	328	14.6	1.00	...		68	48.5	1.00	...	
0.5–20	317	14.2	0.93	0.59, 1.44	.73	50	54.0	1.25	0.60, 2.60	.55
21–40	223	16.6	1.12	0.70, 1.79	.64	31	54.8	1.36	0.57, 3.20	.49
41+	245	17.6	1.11	0.70, 1.75	.66	36	44.4	0.86	0.38, 1.94	.71
Caffeine, mg/day										
None	340	15.9	1.00	...		63	54.0	1.00	...	
1–200	231	14.7	0.98	0.61, 1.56	.92	42	47.6	0.80	0.36, 1.75	.58
201–400	288	17.7	1.21	0.79, 1.86	.37	46	45.7	0.72	0.33, 1.55	.40
401+	262	14.1	1.00	0.63, 1.59	.99	36	52.8	1.04	0.45, 2.42	.92

Note. CI = confidence interval.

^aOverall symptom score of ≥8.

^bAge-adjusted (except OR for age groups).

dichotomized for analyses. Men reporting any bother, as measured by the quality of life query at the end of the American Urological Association questionnaire, were considered symptomatic (score of 1 or higher for that question).

The term “enlarged prostate” refers to the specific characterization derived from our questionnaire. The term “benign prostatic hyperplasia” (BPH) is used when referring to literature or other sources using that term, often when there was clinical confirmation.

Data Handling and Statistical Analyses

Two-way contingency tables were evaluated by χ^2 statistics when factors were considered nominal and by Mantel-Haenszel χ^2 when factors were considered ordinal.¹⁰ Unadjusted attribute risk was computed for selected lifestyle factors and medical conditions.¹¹ We used ordinal and binomial logistic regression to assess relationships while adjusting for other potentially related factors, such as age. SAS was used to perform all analyses.¹²

Many characteristics were considered that are not reported here. We based our choice of factors in part on statistical significance (bearing in mind the number of relationships examined) and in part on our determination of their biological relevance.

Results

Responses to individual questions indicated that most men were bothered very little

by BPH. Frequency of urination and nocturia are reported most frequently, with 57% and 65% of men, respectively, reporting these symptoms. Thirty percent of men reported sensations of not emptying, intermittency, urgency, and weak stream, while only 13% of men reported straining or pushing. The frequency of reporting any of these symptoms increased with increasing age, although data for the eldest age group were slightly lower than for the penultimate age group; this was possibly related to the small number of subjects in the eldest group (Table 1). Quality of life related to urinary symptoms, as reflected in responses to the questionnaire, was inversely related to age (data not shown).

The proportion of men reporting that they had been told they had an enlarged prostate increased with age, from 9.4% of those aged 48 to 59 years to 83.8% of those 80 years or older ($P < .001$). The proportion of men who reported having had prostate surgery increased from 2.4% of those aged 48 to 59 years to 45% of those 80 years or older. Since men reporting an enlarged prostate had higher scores and because there were significant interactions between having a history of enlarged prostate and many of the potential risk variables, we modeled data from this group separately. Additionally, those men who had had prostate surgery were removed for all analyses.

There were no significant associations between blood pressure and symptoms (Table 1). Current use of diuretic agents (primarily for blood pressure) was significantly associated with symptom score in those whose prostate was not enlarged ($P = .0006$). History of cardiovascular disease was significantly related to overall symptom score among those with an enlarged prostate ($P = .03$) (Table 1). The relationship of diabetes to overall symptoms was of borderline significance among those without an enlarged prostate. Alcohol use, smoking, and caffeine intake were unrelated to symptom scores (Table 1).

We performed a full multivariable logistic regression, allowing all potentially relevant characteristics to enter in a stepwise method after controlling for age. Only current use of diuretic agents was significantly associated with symptoms among those without an enlarged prostate, and only history of cardiovascular disease was significant among those with an enlarged prostate (data not shown).

We evaluated whether risk variables were related to individual symptoms (data not shown). Urinary frequency was significantly related to alcohol and use of diuretics among those without a history of an enlarged prostate and to cardiovascular disease among those with an enlarged prostate. Diabetes was also related to urinary frequency (borderline

significance) in both groups, and this was not attributable to glycosuria. Urgency of urination was related to cardiovascular disease, diabetes, and use of blood pressure medications among those with an enlarged prostate. Nocturia was related to use of diuretics, cardiovascular disease, diabetes, and alcohol consumption among those without an enlarged prostate.

In unadjusted analyses, a moderate elevation of blood pressure (systolic blood pressure of at least 140 mm Hg and/or diastolic blood pressure of at least 90 mm Hg) and use of diuretic agents have associated attributable risks exceeding 10%, while history of cardiovascular disease, presence of diabetes, and ever having smoked have associated attributable risks of more than 5% among those with no history of an enlarged prostate. Similar trends were noted among men reporting an enlarged prostate.

Quality of life related to urinary symptoms was significantly inversely related to each of the specific urinary symptoms ($P < .001$ for each relationship) (data not shown). After adjustment for overall symptom score, age and use of diuretics among those without an enlarged prostate were also significantly inversely associated with this measure of quality of life.

Discussion

Responses to the American Urological Association questionnaire have been found to be highly reliable in several studies, and they appear to give more consistent results about estimates of the prevalence of BPH than do rates based on other questionnaires.¹³ The questionnaire's ability to detect "true" cases has been validated in at least 1 circumstance.³ We have found that responses to this questionnaire, as reflected in overall symptom score, are associated not only with a history of enlarged prostate but also with a history of cardiovascular disease and use of diuretics (primarily for hypertension).

Some of the potential causes of urinary symptoms cannot be easily prevented. Even with the advent of medical treatment for BPH,¹⁴ its symptoms in many individuals are still problematic. However, some exposures can be modified. The choice of anti-hypertensive agent might be altered to avoid use of diuretic agents among men bothered by urinary symptoms. We cannot determine the likely physiologic effect of alcohol on some of the specific urinary symptoms; that is, we cannot tell whether the effect is a chronic change in urinary function or whether we are detecting a direct diuretic effect. However, limiting

alcohol intake in those who are symptomatic may be worthwhile.

We do not know whether BPH is a "comorbid" condition with cardiovascular disease (or diabetes) in our subjects or whether some of the causes underlying the diseases are the same. However, if the urinary symptoms are common to BPH, cardiovascular disease, and diabetes, the patient and the practitioner may become confused as to the likely cause. Thus, when epidemiologists and clinicians evaluate responses to the questionnaire, they need to be aware that the symptoms may be related to other diseases as well as BPH and to consider these other causes in further workup of symptomatic men. □

Contributors

B. E. K. Klein and R. Klein designed the Beaver Dam Eye Study. B. E. K. Klein sought the collaboration of R. Bruskevitz in choosing relevant questions. R. Bruskevitz, an originator of the American Urological Association questionnaire, suggested that instrument and advised in its use in the field study. He participated with B. E. K. Klein as well as with R. Klein and K. E. Lee in appropriate data analyses. B. E. K. Klein took primary responsibility for designing and directing the data analyses and writing up the results. K. E. Lee did the actual data analyses.

Acknowledgments

This research was supported by National Institutes of Health grant EYO6594 (R. Klein, B. E. K. Klein).

References

1. Barry MJ, Mulley AG Jr, Fowler FJ Jr, Wennberg JW. Watchful waiting vs immediate transurethral resection for symptomatic prostatism: the importance of patients' preferences. *JAMA*. 1988;259:3010-3017.
2. Jacobsen SJ, Guess HA, Panser L, et al. A population-based study of health care-seeking behavior for treatment of urinary symptoms: the Olmsted County Study of Urinary Symptoms and Health Status Among Men. *Arch Fam Med*. 1993;2:729-735.
3. Barry MJ, Fowler FJ Jr, O'Leary MP, et al. The American Urological Association symptom index for benign prostatic hyperplasia. The Measurement Committee of the American Urological Association. *J Urol*. 1992;148:1549-1557.
4. Campbell JA, Palit CD. Total digit dialing for a small area census by phone. *Proceedings of the Survey Research Methods Section of the American Statistical Association*. 1988;549-551.
5. Klein R, Klein BEK, Linton KLP, De Mets DL. The Beaver Dam Eye Study: visual acuity. *Ophthalmology*. 1991;98:1310-1315.
6. Klein BEK, Klein R, Moss SE. Incident cataract surgery: the Beaver Dam Eye Study. *Ophthalmology*. 1997;104:573-580.

7. Hypertension Detection and Follow-up Program Cooperative Group. The hypertension detection and follow-up program. *Prev Med.* 1976;5:207-215.
8. Klein R, Klein BEK. *Beaver Dam Eye Study II. Manual of Operations.* Springfield, Va: US Dept of Commerce; 1995. NTIS accession no. PB 95-273827.
9. Klein R, Klein BEK, Moss SE, Linton KLP. The Beaver Dam Eye Study: retinopathy in adults with newly discovered and previously diagnosed diabetes mellitus. *Ophthalmology.* 1992;99:58-62.
10. Mantel N. Chi-square tests with one degree of freedom: extensions of the Mantel-Haenszel procedure. *J Am Stat Assoc.* 1963;58:690-700.
11. Kahn HA. *An Introduction to Epidemiologic Methods.* New York, NY: Oxford University Press; 1983:56-62.
12. *SAS/STAT User's Guide, Version 6.* 4th ed. Vol 1 and 2. Cary, NC: SAS Institute Inc; 1990.
13. Guess HA, Chute CG, Garraway WM, et al. Similar levels of urological symptoms have similar impact on Scottish and American men—although Scots report less symptoms. *J Urol.* 1993;150(5, pt 2):1701-1705.
14. McConnell JD, Bruskevitz R, Walsh P, et al. The effect of finasteride on the risk of acute urinary retention and the need for surgical treatment among men with benign prostatic hyperplasia. *N Engl J Med.* 1998;338:557-563.

A Further Analysis of Race Differences in the National Longitudinal Mortality Study

Daisy S. Ng-Mak, MS, Bruce P. Dohrenwend, PhD, Ana F. Abraido-Lanza, PhD, and J. Blake Turner, PhD

ABSTRACT

Objectives. The purpose of this study was to investigate associations between race and specific causes of mortality among adults 25 years and older in the National Longitudinal Mortality Study.

Methods. Mortality hazard ratios between races during 9 years of follow-up were estimated with Cox proportional hazards models, with control for multiple indicators of socioeconomic status (SES) and SES-relevant variables.

Results. Black persons younger than 65 years were at higher risk than others for all-cause and cardiovascular mortality; the strongest effects were observed among persons aged 25 through 44 years.

Conclusions. Race, independent of SES, is related to mortality in American society, but these effects vary by age and disease categories. (*Am J Public Health.* 1999;89:1748-1751)

The widening gap in life expectancy between Whites and Blacks in the United States during the 1980s¹⁻³ has invigorated debates about the effects of race on mortality in American society. With genetic differences discredited as explanations of Black-White differences in overall mortality,⁴ and race differences in risk factors such as smoking and alcohol use explaining only part of this differential,⁵ recent writers have pointed to discrimination and its effects on high blood pressure,⁶ racist attitudes surrounding the delivery of medical care,^{7,8} and the segregation of Blacks in stressful⁹ and polluted¹⁰ inner cities as reasons for racial differences in morbidity and mortality.

But the extent to which race differences in mortality reflect race per se, rather than race differences in socioeconomic status (SES), is a matter of ongoing controversy.^{5,11-18} The National Longitudinal Mortality Study (NLMS) is perhaps the best study of this issue to date. That study found that with control for one indicator of SES, family income, Blacks younger than 65 years had higher rates than Whites for all-cause, cardiovascular, and cancer mortality.¹⁷

Our purpose was to extend the NLMS analyses in 3 ways. First, we examined race effects on mortality from specific disorders with more comprehensive controls of SES. This was done by including not only family income, as in previous NLMS analyses of specific disorders,¹⁷ but also the more comprehensive controls used in previous analyses of all-cause mortality.¹⁸ These consisted of the SES indicators education and employment status and the SES-relevant variables marital

status and household size. In addition, we included a measure of occupational prestige.¹⁹ Second, we investigated disease-specific racial differences, not only for cardiovascular and cancer mortality but also for other specific causes of death. Third, we clarified the Black-White comparisons by excluding Hispanics from the analysis. Despite their low SES and higher rates of some causes of death, such as homicide, Hispanics have been found to have lower rates of cardiovascular and cancer mortality than non-Hispanic Whites.

Methods

The NLMS links 10 Current Population Surveys, conducted by the US Bureau of the Census between 1978 and 1985, with the National Death Index, a computerized file of all deaths since 1979. The Current Population Surveys provide social, demographic, and

Daisy S. Ng-Mak is with the Psychiatric Epidemiology Training Program, The Joseph L. Mailman School of Public Health, Columbia University, New York, NY. Bruce P. Dohrenwend is with the Psychiatric Epidemiology Training Program, Department of Psychiatry at Columbia University, and the New York State Psychiatric Institute. At the time of the study, Ana F. Abraido-Lanza and J. Blake Turner were with the Psychiatric Epidemiology Training Program, Columbia University.

Requests for reprints should be sent to Daisy S. Ng-Mak, MS, Columbia University, The Joseph L. Mailman School of Public Health, EPI PH Bldg 18-304, PET, 600 W 168th St, 7th Floor, New York, NY 10032 (e-mail: dsn3@columbia.edu).

This brief was accepted May 26, 1999.