Prostate Cancer Screening and Mortality in Blacks and Whites: A Hospital-based Case-Control Study

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Background: Prostate cancer incidence and mortality are substantially higher in Black than in white men. Prostate cancer screening remains controversial. This study was conducted to assess the impact of, and racial differences in, prostate cancer screening on prostate cancer mortality.

Methods: This was a case-control study of Black and White men in eight hospitals. Cases were deaths related to prostate cancer; controls were hospital-based subjects that were frequency-matched to cases based on age and race. Multivariable logistic regression was used to test the association between screening and prostate cancer mortality.

Results: Cases had fewer PSA (prostate-specific antigen) tests than controls (1.73 vs. 3.98, p<0.001). White controls had higher rates of PSA tests than other sub-groups. There was no difference in PSA testing between Black cases and controls. Mean co-morbidity was 10.3 in cases and 2.63 in controls. Prostate cancer mortality was 55 to 57% lower among the screened persons. Individuals who died of prostate cancer related causes were less likely to have received PSA testing (OR=0.65; 95% CI 0.56–0.75).

Conclusions: The odds of dying from prostate cancer were lower among white men receiving screening tests. Having less co-morbidity was associated with lower odds of mortality in both races. This study raises the possibility that screening for prostate cancer with the PSA test may be more effective in white than in Black men.

Key words: Prostate cancer ■ mortality ■ prostate specific antigen ■ digital rectal examination ■ co-morbidity

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INTRODUCTION

Although the number of men receiving prostate cancer screening has increased significantly over recent years,[1–3] a major question still facing cancer researchers, policy-makers, and healthcare providers is the effectiveness of the commonly used screening tests, prostate-specific antigen (PSA) and digital rectal examination (DRE), in reducing prostate cancer mortality. In the past decade, studies have yielded conflicting results that consequently have led to conflicting public health policy recommendations.[4–8] Inconsistent screening recommendations have been promulgated by professional and governmental organizations such as the American Cancer Society (ACS), the American Urologic Association (AUA), the American Medical Association (AMA), the National Cancer Institute (NCI), and the United States Preventive Services Task Force (USPSTF)[3,9]. Consequently, decisions regarding prostate cancer diagnosis and treatment are made with difficulty by health professionals and their patients. In addition, although PSA testing has emerged as the standard screening test, there is disagreement as to what the normal range of PSA levels is and how these levels should be used in the diagnosis and prognosis of prostate cancer.

Despite the uncertainty, however, there has been an increasing use of the tests in the United States since 1988, accompanied by significant changes in prostate cancer incidence and mortality rates. The changes, which include a rise in incidence rate from 1988 to 1992, a sharp decrease in mortality in each year between 1992 and 1995, and a further decline into the 2000s,[10–13] have been attributed to increased awareness of the disease and efforts at early diagnosis following the advent of PSA testing in 1986.[12, 14, 15] Notwithstanding advances in the understanding of the disease, African American men have continued to experience significantly higher incidence and twice the death rates of Whites.[16–18] These racial disparities in both morbidity and mortality have not been adequately studied nor explained. It is generally believed that some combination of factors, such as biology of prostate cancer, stage at diagnosis, access to health care, insurance-related factors, or demographic factors may account for the disparity.[19, 20]

We report the results of a hospital-based matched case-control study involving patients from the states of Georgia and Florida. These states were selected because they represent a relatively large proportion of the African American population in the country and are thus capable of providing sufficient cases for a hospital-based study that can be generalized to White and Black populations. The aims of the study were to determine if screening with DRE and PSA reduces prostate cancer mortality, to assess the differential impact of prostate cancer screening on Black and

White prostate cancer mortality, and to assess the utilization of prostate cancer screening among these two populations. We hypothesized that a lower frequency of screening tests would be found among the cases compared to the controls; that is, the frequency of screening tests would be higher in the general population than in the group of men who died of prostate cancer-related causes. Additionally, we hypothesized that frequency of screening tests would be higher among Whites than among Blacks.

METHODS

Study Sites and Patients

We implemented the study in the five Atlanta area Surveillance, Epidemiology, and End Results (SEER) counties of Clayton, Cobb, DeKalb**,** Fulton and Gwinnett and in Alachua and Duval counties in north central Florida. Linkage and review of hospital records were limited to the following hospitals in Atlanta: Grady Memorial Hospital, Emory University Hospital, Piedmont Hospital, Crawford Long Hospital (now known as Emory University Hospital Midtown), DeKalb Medical Center, and Veterans Affairs Hospital. In Florida, records were abstracted from Shands Hospital in Jacksonville and the North Florida/South Georgia Veterans Health System in Gainesville.

Deaths related to prostate cancer were ascertained directly from the Georgia and Florida departments of health. Death records were systematically linked to hospital records using seven identifiers: name, social security number, date of birth or age, date of death, race, county of death, and county of residence. Cases were identified through a review of county death certificates and hospital discharge lists and were defined according to the International Classification of Diseases Codes (ICD-9). Cases were histologically confirmed deaths from prostate cancer, i.e., individuals with a diagnosis of prostate cancer (ICD 185) and whose underlying cause of death was prostate cancer. They included deaths that occurred between 1998 and 2001; since PSA screening for prostate cancer was approved in 1984 and became widespread by 1986, the selected time interval gave a 12 to 14-year time frame for a meaningful retrospective assessment of exposure to screening to be conducted with the potential of minimizing omissions or misclassifications of true cases.

Controls were hospital patients whose records contained the results of PSA and DRE tests. Efforts were made to avoid or control for selection biases in the study. For instance, to avoid introduction of bias into the screening assessment and since the objective of the study was to determine whether screening reduces mortality, we did not use death as a criterion in the selection of controls (i.e., controls could be dead or alive). In addition, to allow for generalization of the findings to the larger population, the study used multiple hospitals to avoid any admission or referral patterns to specific hospitals. After these considerations, the controls were frequency-matched to cases on the basis of age (within 5 years) and race. Controls were selected from the same hospitals as their matched cases or were hospitalized during the dates of their matched cases' final hospitalization. A history of prostate cancer was not an exclusion criterion for controls provided that this was not their cause of death.

Sample size was calculated using these parameters: a confidence level of 5%, a power of 80% and estimated proportion of exposure to controls of 50%. Based on these parameters, the required sample size per group was 387 for detecting a difference of 10% between group proportions of exposure to screening. Overall, data for 404 cases and 404 matched controls were obtained and analyzed. Hospital and laboratory records were reviewed to assess the frequency of DRE and PSA testing in cases and controls for a period of 12 to 14 years prior to the date of death of the case and to include the exposure period prior to the reference date of diagnosis of the case. The records were also used to abstract data on demographics, co-morbidities, and medical history of other types of cancers.

Assessment of Screening Tests and Co-morbidities

We defined co-morbidity as any health condition (excluding prostate cancer) that was diagnosed or still active during the retrospective assessment period before and after the diagnosis of prostate cancer. Special attention was given to conditions that may significantly influence a patient's survival, i.e., prognostic co-morbidities such as ischemic heart disease, heart failure, etc., and we assessed co-morbidity as the total number of such health conditions abstracted from the medical records for all selected cases and controls. We controlled our analyses for co-morbid conditions because they constitute an aspect of health status that might have a potential confounding effect on our results. Records of screening tests and co-morbidities were log-transformed to comply with the normality assumption prior to analyses.

Data Analysis

Independent samples t-tests and chi-square analyses were performed to assess whether the observed frequencies and likelihood of receiving the screening tests differed between cases and controls as well as between Blacks and Whites. Unadjusted odds ratios with corresponding 95% confidence intervals (CI) for prostate cancer death were computed and used to determine whether the odds of dying from prostate cancer associated with DRE and PSA testing differed between cases and controls.

The levels of co-morbidity in the cases and controls were analyzed using chi-square tests to determine whether the two groups differed with respect to the prevalence of