

PROSTATE CANCER RISK IS THREE-FOLD HIGHER AMONG MEN, AGED 50–64, OF AFRICAN DESCENT COMPARED WITH MEN OF ASIAN-INDIAN DESCENT IN TRINIDAD AND TOBAGO

Objective: To test the hypothesis that the screening-detected prevalence of prostate cancer is higher among men of African descent than among men of Asian-Indian descent living in Trinidad & Tobago.

Design: Population-based prostate cancer screening study among men aged 50–64.

Setting: Caribbean islands of Trinidad and Tobago.

Participants: Tobago, population-based sample of 1196 male residents of African descent; Trinidad, 173 agricultural workers of Asian-Indian descent.

Interventions: Serum prostate specific antigen (PSA, Abbot AxSYM) and digital rectal exam (DRE) were used to screen men for prostate cancer. Men with elevated PSA (≥ 4 ng/mL) and/or abnormal DRE were offered an ultrasound guided sextant biopsy of the prostate gland.

Main Outcome Measures: Prevalence of abnormal screen; prevalence of prostate cancer.

Results: Elevated PSA and/or abnormal DRE were observed in 29% (348/1196) of Afro-Tobagonian men. Three hundred sixteen men underwent biopsies. Screening-detected prostate cancer prevalence was: 4.9% (23/468) for those aged 50–55; 7.7% (28/366) for those aged 55–59; and 13.3% (48/362) for those aged 60–64 years. Screening was abnormal in 18% (31/173) of Asian-Indian men; 25 underwent biopsies. Prostate cancer prevalence in Asian Indian men was: 1.6% (1/63) for those aged 50–54; 1.4% (1/71) for those aged 55–59; and 5.1% (2/39) for those aged 60–64 years. Mantel-Haenszel age-adjusted rate ratio was 3.4, 95% CI 1.3–9.0.

Conclusions: This study establishes a high prevalence of screening-detected prostate cancer among Afro-Tobagonians compared with Indo-Trinidadians. Comparison of candidate genes, environmental, and lifestyle factors between these populations may identify factors that increase risk for, or provide protection against, prostate cancer. (*Ethn Dis.* 2002;12[suppl3]:S3-30-S3-33)

Key Words: Prostate Cancer, Screening, Prevalence, African Descent, Asian Indian Descent

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INTRODUCTION

Studies conducted on the Caribbean islands of Jamaica¹ and Tobago² have demonstrated that risk for prostate cancer among Afro-Caribbean men is high, and may exceed the risk in African-American men, among whom high risk is well established.³ Determinants of this risk are unknown, but may include genetic, lifestyle, and environmental factors. Except for data of unknown completeness derived from a very few cases from the Bombay Cancer Registry,⁴ and from men of Asian Indian descent in the Singapore Cancer Registry,⁴ there is a virtual absence of published data regarding mortality, incidence, prevalence, or screening-detected prevalence of prostate cancer among men of Asian Indian descent. World-standardized incidence rates per 100,000 per year (aged 30–74), reported for 1985, were 9.2 in Bombay and 11.7 among Asian Indians in Singapore, compared with 92.6 among Detroit Whites, and 158.2 among Detroit African Americans.⁴

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These data suggest a low risk for prostate cancer among Asian Indians, as is observed in other Asian groups, eg, Japanese and Chinese,⁴ despite considerable variation in genetic background, lifestyle, and environment. The current study was undertaken to examine the truth of the anecdotal certainty, expressed by urologists in Trinidad and Tobago that risk for prostate cancer is much lower among the Asian-Indian men of Trinidad and Tobago compared with their fellow countrymen of African descent. Agricultural workers of Asian Indian descent in central Trinidad were screened for comparison with an ongoing screening study on the island of Tobago which was reported previously in part.²

METHODS

Populations

The populations screened resided on the islands of Trinidad and Tobago. The 1990 census¹ of Trinidad and Tobago enumerated 5121 males aged 40–79, residing on the island of Tobago, of whom 92% reported African ancestry. Recruitment was carried out by word of mouth, by healthcare workers at the hospital and health centers, by private physicians, posters, flyers, public service announcements, and through public presentations by oncologists and urologists from Trinidad and the United States. Of the 5121 males, 3125 participated in the screening, 1196 of whom were aged 50–64 years and are included in this report. A general population-

Table 1. Screening and biopsy results among 1196 Tobago men age 50–64 years

Age Group	Screen Test	No. Screen	No. Abnorm	Percent Abnorm	No. Biopsy	No. Pr Ca	Pos Predict Value	Screening Prevalence Pr Ca/100
50–54	PSA	427	39	9	32	17	53	4.0
	DRE	354	73	21	67	10	15	4.2
	Either	468	102	22	99	23	23	4.9
55–59	PSA	339	53	16	42	19	45	5.6
	DRE	277	80	29	67	17	25	6.1
	Either	366	115	31	104	28	27	7.7
50–64	PSA	341	87	26	68	37	54	10.9
	DRE	292	77	26	65	28	43	9.6
	Either	362	131	36	113	48	42	13.3
Total	PSA	1106	179	16	142	73	51	6.6
50–64	DRE	923	230	25	199	55	28	6.0
	Either	1196	348	29	316	99	31	8.3

based screening was not feasible on the larger island of Trinidad, with a population of approximately 1.2 million, 40% of whom are of Asian-Indian descent. Therefore, an industry-based screening was conducted at a large agro-industrial complex, Caroni (1975) Ltd, with a predominantly Asian-Indian workforce. Recruitment at the complex was carried out by informing union officials, and conducting meetings with selected work crews employed in the vicinity of company health clinics.

Informed Consent

Consent was obtained using forms and procedures approved by the Institutional Review Boards of University of Pittsburgh Institutional Review Board, the Tobago Ministry of Health and Social Services, and Caroni (1975) Ltd.

Screening

The screening was conducted at the Tobago Prostate Survey office, Scarborough, Tobago, and at the medical clinics of Caroni (1975) Ltd, located in Couva and other areas in central Trinidad. Data collected included ethnicity, education, occupation, smoking status, medical history, personal and family cancer history, vasectomy, prostate symptoms, health screening history, alcohol intake, detailed occupational history, and height, weight, and waist and hip measurements. Systematic digital

rectal exams (DRE) were performed by physicians trained according to the study protocol. This exam was scheduled after the blood draw, in order to avoid an artifactual increase in serum PSA, which may follow digital manipulation of the gland. Serum PSA levels were measured at the University of Pittsburgh Central Pathology Laboratory using the automated Microparticle Enzyme Immunoassay, Abbot AxSYM PSA assay (Abbott Laboratories, Abbott Park, Ill).

Participants with abnormal screening results, ie, abnormal DRE (except for simple enlargement without palpably abnormal areas) or elevated PSA (≥ 4.0 ng/mL), were referred to the Tobago Regional Hospital or the central Caroni (1975) Ltd Medical Clinic for biopsy. The Tobago biopsy team, made up of surgeons and an ultrasound technician trained by urologists from the University of Pittsburgh Medical Center, performed all the biopsies in both Trinidad and Tobago. Trans-rectal ultrasound guided sextant biopsies were obtained according to a standard protocol using an 18 gauge, 21 cm spring-loaded biopsy needle (Boston Scientific, Natick, Mass). Histopathological examination of the formalin-preserved biopsy specimens was conducted at the University of Pittsburgh Department of Pathology, and included the reporting of: presence or absence of high grade pro-

tatic intra-epithelial neoplasia (PIN), presence or absence of cancer, location of cancer, peri-neural invasion and Gleason score of cancer. The Gleason score, ranging from 1 to 10, is based on the organization of the cancer tissues, with low scores reflecting well organized, less aggressive tumor tissue, while high scores represent highly disorganized, more aggressive tumor tissue.

Data Analysis

Age-specific prevalence rates (per 100 screened men) were calculated. Rates were compared by the method of Mantel-Haenszel using the statistical program, EPIDANAL.⁶ Positive predictive value of the screening tests was calculated as the number of men diagnosed with prostate cancer divided by the number of men with abnormal DRE and/or elevated PSA who underwent biopsy. All statistical calculations were performed using SPSS 10.0 for Windows (SPSS, Chicago, Ill).

RESULTS

On the island of Tobago, 1196 men of predominantly African descent, aged 50–64, were screened for prostate cancer. On Trinidad, 173 men of Asian-Indian descent, aged 50–64, were screened. Screening results by 5 year age group are shown in Tables 1 and 2. Rates of elevated PSA (≥ 4 ng/mL) were markedly higher among Afro-Tobagonians (16% overall, ranging from 9% to 26% across age groups) than among Indo-Trinidadians (3%, ranging from 2% to 6%). The Mantel-Haenszel rate ratio (Afro-Tobagonian/Indo-Trinidadian) across age groups was 5.1, 95% CI 2.5–10.6. The rates of abnormal DRE screening varied less, with 25% in Tobago men compared with 18% among Indo-Trinidadians. Overall, abnormal results for DRE and/or PSA were observed among 348 of the 1196 (29%) screened men in Tobago, and among 31 of the 173 (18%) Indo-Trinidadians. A

Table 2. Screening and biopsy results among 173 Indo-Trinidadian men age 50-64 years

Age Group	Screen Test	No. Screen	No. Abnorm	Percent Abnorm	No. Biopsy	No. Pr Ca	Pos Predict Value	Screening Prevalence Pr Ca
50-54	PSA	59	1	2	1	1	100	1.7
	DRE	62	10	16	7	1	14	1.6
	Either	63	10	16	7	1	14	1.6
55-59	PSA	71	2	3	1	0	0	0
	DRE	69	11	16	10	1	10	1.4
	Either	71	12	17	10	1	10	1.4
50-64	PSA	36	2	6	2	1	50	2.8
	DRE	39	9	23	7	2	29	5.1
	Either	39	9	23	8	2	25	5.1
Total	PSA	166	5	3	7	2	50	1.2
50-64	DRE	170	30	18	24	4	17	2.4
	Either	173	31	18	25	4	16	2.3

high percentage of men in each population consented to undergo biopsy: 316 of 348 (91%) in Tobago, and 25 of 31 (81%) in Trinidad.

In each population, half of the men with elevated PSA undergoing biopsy were diagnosed with prostate cancer, yielding a positive predictive value of 50% for the screening test. The positive predictive value for abnormal DRE was lower than for elevated PSA: 28% and 17% in the Tobago and Trinidad populations, respectively (Tables 1 and 2).

Screening-detected prevalence rates of prostate cancer were much lower among the Indo-Trinidadians, ranging from 1.7/100 to 5.1/100 across age groups, compared with the Afro-Tobagonians, 4.0/100 to 13.2/100, with overall rates of 2.3/100 for the Trinidadians, compared with 8.3/100 for the Tobagonians (Tables 1 and 2). The Mantel-Haenszel age adjusted rate ratio (Afro-Tobagonian/Indo-Trinidadian) was 3.4, 95% CI 1.3-9.0.

Among the 99 Tobago men diagnosed with prostate cancer, the distribution of Gleason scores was: one with Gleason 5; 61 with Gleason 6; 31 with Gleason 7; 5 with Gleason 8; and 5 with Gleason 9. Among the 25 Trinidad men who underwent biopsy, 4 cases of prostate cancer were diagnosed, 2 with Gleason 6, and 2 with Gleason 7.

DISCUSSION

This study supports the local clinical impression of lower rates of prostate cancer among men of Asian-Indian descent, as compared with men of African descent residing in Trinidad and Tobago. However, the observed 3-fold difference is much smaller than the 10-15 fold higher rates among Whites and African Americans in the Detroit registry, as compared with populations in the Bombay and Singapore registries.⁴ The differences found in the 3 countries' registries are likely to be magnified by methodological differences. A shortcoming of the current study is the truncation of age to 50-64 years. Extension of comparisons across older age groups could uncover even larger differences in risk between the African and Asian Indian descent populations.

The Trinidad and Tobago populations studied are both primarily rural populations and share the same general environment. However, the microenvironments of these 2 populations are likely to differ in environmental factors, and in lifestyle and dietary factors. For example, agricultural workers in central Trinidad are likely to experience higher levels of general air and water pollution than those in Tobago, and are also likely

to experience chronic pesticide exposure. A meta-analysis of risk for prostate cancer in occupational studies in the United States demonstrated a higher risk among farmers, thus indicating a possible link to pesticide/herbicide exposure.⁷ If pesticide/herbicide exposure does increase risk, it is possible that even lower rates of prostate cancer would have been observed had we studied a non-agricultural Asian-Indian population.

Dietary studies of the 2 populations have not been reported. In general, older, rural Asian Indian populations tend to consume a traditional Asian-Indian diet. One dietary factor anecdotally hypothesized to reduce prostate cancer risk among Asian Indians in Trinidad is the regular consumption of tomato choka, a cooked salsa. Tobagonians consume some Asian-Indian foods, but generally consume a broad Caribbean diet, and an increasing amount of American-style fast foods.

In a recent study, we found that seropositivity for human herpes virus 8 (HHV8, Kaposi sarcoma virus) was associated with a 2-fold greater risk for prostate cancer among Tobago men.⁸ A difference in the rate of seropositivity for HHV8, currently unknown in Trinidad, could contribute to the different levels of observed risk.

Finally, we hypothesize that the distributions of polymorphisms in hormone-related loci, which may influence prostate cancer risk (eg, the androgen, estrogen, and growth-hormone related receptors), differ between populations. Bone mineral density, a sex-hormone related measure, is lower among Asian Indians compared to other populations.⁹ Polycystic ovary syndrome, a condition with a strong genetic determination, is highly prevalent among women of Asian-Indian descent living in Great Britain.¹⁰ It is unknown whether the expression of this condition of disordered hormone metabolism in men might influence prostate cancer risk.

CONCLUSIONS

We conclude that prostate cancer risk is considerably higher among Tobago men of African descent as compared to Trinidad men of Asian-Indian descent, aged 50–64 years. Research conducted on the differences in environment, lifestyle, and genetic factors between these populations should deepen our understanding of the etiology of prostate cancer.

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