### AORTIC

# A study of PSA values in an unselected sample of Senegalese men

Mohamed Jalloh, MD,<sup>1</sup> Charnita Zeigler-Johnson, PhD,<sup>2</sup> Marguette Sylla-Niang, PhD,<sup>1</sup> Lamine Niang, MD,<sup>1</sup> Issa Labou, MD,<sup>1</sup> Karamo A. Konte, MD,<sup>2</sup> Timothy R. Rebbeck, PhD,<sup>2</sup> Serigne Gueye, MD<sup>1</sup>

<sup>1</sup>University Cheikh Anta DIOP, Hôpital Général de Grand Yoff, Dakar, Senegal <sup>2</sup>Center for Clinical Epidemiology and Biostatistics, Department of Biostatietics and Edpidemilogy and Abramson Cancer Center, University of Pennsylvania, Philadelphia, Pennsylvania, USA

JALLOH M, ZEIGLER-JOHNSON C, SYLLA-NIANG M, NIANG L, LABOU I, KONTE KA, REBBECK TR, GUEYE S. A study of PSA values in an unselected sample of Senegalese men. The Canadian Journal of Urology. 2008;15(1):3883-3885.

**Objectives:** Limited data exist about prostate cancer screening in Africa. The goal of this study was to describe the distribution of prostate-specific antigen (PSA) values in an unselected population of Senegalese men being screened for prostate cancer, and to assess the role of PSA screening tests in the early detection of prostate cancer in this population.

**Patients and methods:** We undertook a cross-sectional study in a community outreach setting with 113 unselected Senegalese men. Participants completed a questionnaire, underwent a digital rectal examination (DRE), and provided a blood sample for PSA testing. The questionnaire focused on demographic data, voiding problems, PSA values, and cigarette smoking. The Kruskal-Wallis test and the Fisher exact test were used to describe differences in PSA values among the groups. **Results:** The median age of the participants was 65 years

#### Introduction

Prostate cancer is the most common non-cutaneous male cancer and its incidence has increased since the wider use of prostate-specific antigen (PSA) screening for early cancer detection.<sup>1,2</sup> In 2004 in the United States, the estimated incidence of prostate cancer was

Accepted for publication December 2007

Address correspondence to Dr. Mohamed Jalloh, University Cheikh Anta DIOP, Hôpital Général de Grand Yoff, PO Box 12103, Dakar, Senegal (range, 36-87 years). Five percent of the men knew about PSA screening and 3% had ever been tested for PSA. The median PSA value overall was 1.28 ng/ml (range, 0.14 ng/ ml-50.16 ng/ml). In the first 3 age quartiles (< 55, 55-64, and 65-72 years), the median PSA increased with age (1.0, 1.3, and 2.3 ng/mL, respectively; p = 0.012) as did the percentage of men with  $PSA \ge 4.0 \text{ ng/ml} (4\%, 7\%, \text{and } 28\%)$ respectively; p = 0.034). The percentage of men with a PSA  $\geq$  4 ng/ml was higher in the abnormal versus normal DRE group (p = 0.023), while the median PSA was lower in the smoking versus nonsmoking group (p=0.022). We found no relationship between PSA and occupation or ethnic group. Conclusion: PSA screening is not widely used in Senegalese men. In this sample, the likelihood of having an abnormal PSA increased with age and was more common in men with abnormal DREs. These results may motivate additional studies to determine if wider use of PSA testing in this population could lead to the detection of more prostate cancer cases and improve clinical outcomes among cancer cases.

**Key Words:** PSA, prostate cancer, early detection, ethnicity

145.3 cases/100000 men.<sup>3</sup> The greater use of PSA testing has led to an increase in the number of prostate cancer cases that are diagnosed early.<sup>2</sup> To date, there is no nomogram for prostate cancer screening relevant to sub-Saharan Africa (the area of Africa south of the Sahara desert) and few studies have examined the epidemiology and management of prostate cancer in this region. The aim of this study was to examine the awareness of PSA screening and to determine the distribution of PSA values in a nonselected population of Senegalese men, and to explore whether PSA testing could play a role in the early detection of prostate cancer in these men.

#### Materials and methods

We undertook a cross-sectional study in a community outreach setting in Senegal in which 113 unselected men with no known history of prostate cancer or prostate disease completed a questionnaire, underwent a digital rectal exam (DRE), and provided a blood sample for PSA testing. All participants were from two regions of Senegal: the region around Dakar, the capital city - partly in the city (urban) and partly in Sendou village (rural) — and Fimla village in the Fatick region (rural). The questionnaire focused on demographic details, knowledge of PSA testing, previous PSA values and DRE results, and tobacco use. Descriptive analyses were carried out for discrete traits. The Kruskal-Wallis test and Fisher exact test were used to compare discrete traits among different groups. Medians were used to summarize continuous traits.

#### Results

The median age of the study participants was 65 years (range, 36-87 years). Most of the men (85%) were from rural regions. Only 5% of them knew about PSA screening and only 3% had ever undergone PSA testing. The distribution of the population by ethnic groups is summarized in Table 1. The two largest ethnic groups were the Serere (48%) and Wolof (39%) groups. Most participants were either farmers (35%) or fishermen (27%), as summarized in Table 2.

The median PSA of the study participants was 1.28 ng/ml (range, 0.14 ng/ml-50.16 ng/ml). A total of 16% of the participants had total PSA values  $\geq$  4.0 ng/mL. We found an abnormal DRE in 11% of cases, and 47% of the men admitted to smoking cigarettes.

TABLE 1. Distribution of the study population among ethnic groups		
Ethnic group	Number of participants (n = 113)	
Serere	48 (42%)	
Wolof	39 (35%)	
Peulh	15 (13%)	
Manding	6 (5%)	
Maure	2 (2%)	
Soninke	2 (2%)	
Sonrai	1 (1%)	

Occupation	Percentage (n = 113)	
Farmers	35%	
Fishermen	27%	
Bricklayers	5%	
Civil servants	5%	
Drivers	5%	
Others	< 5% each	

TABLE 2. Distribution of the study population

The comparison of PSA values among the different groups is summarized in Table 3. In the first 3 age quartiles (< 55, 55-64, and 65-72 years), the median PSA increased with age (1.0, 1.3, and 2.3 ng/ml, respectively; p = 0.012) as did the percentage of men with PSA  $\geq$  4.0 ng/ml (4%, 7%, and 28%, respectively; p = 0.034). The percentage of men with a PSA  $\geq$  4 ng/ml was higher in the abnormal versus normal DRE group (p = 0.023), while the median PSA was lower in the smoking versus smoking group (p = 0.022). We found no relationship between PSA  $\geq$  4 ng/ml and occupation (p = 0.915), ethnicity (p = 0.533, existence of voiding dysfunction (p = 0.123), or geographic origin (p = 0.465).

## TABLE 3. Comparison of PSA values among 113Senegalese men

Group	Median PSA (ng/ml)	PSA ≥4.0 ng/ml
Age quartile		
< 55 (n = 25)	1.0	4%
55-64 (n = 29)	1.3	7%
65-72 (n = 29)	2.3	28%
> 72 (n = 30)	1.3	23%
	p = 0.012	p = 0.034
Abnormal DRE		
No (n = 101)	1.3	13%
Yes (n = 12)	1.8	42%
	p = 0.229	p = 0.023
Cigarette smoking		
No (n = 60)	1.4	20%
Yes (n = 53)	1.1	11%
	p = 0.022	p = 0.208

among occupations

#### Discussion

The purpose of this study was to examine PSA levels in an understudied Senegalese sample. We found that increases in PSA levels were associated with advancing age, nonsmoking status, and abnormal DRE. We found no relationships between PSA levels and occupation (p = 0.915), or ethnicity (p = 0.533), or the existence of a voiding dysfunction (p = 0.123).

Some study participants in this sample were relatively young (36 years old). The study included these young participants since some data in the literature supports the possibility of prostate cancer occurring at this age.<sup>4</sup> We found an increase in median PSA values in the first 3 age quartiles up to age 72. This finding is consistent with the results of Kohayashi<sup>5</sup> in Japan and Lee<sup>6</sup> in Korea, although in the later study, median PSA values increased even in older age groups. The increase in the prevalence of PSA  $\geq$  4.0 ng/ml with increasing age could lead to a higher rate of detection of prostate cancer with increasing age, according to some studies.<sup>5-8</sup> This increase in the rate of PSA  $\ge$  4.0 ng/ml with age is also consistent with some data that suggest that an age-specific cut-off for PSA should be used.<sup>9</sup> The two main ethnic groups (Serere and Wolof) in this study are predominant in the geographic regions where the study was conducted. These areas are close to the sea and also offer land suitable for farming, and most people who live there are farmers or fishermen.

Data in the literature suggest that a PSA cut-off value of 4 ng/ml gives the highest sensitivity and specificity for the detection of prostate cancer.<sup>10</sup> In our study, 16% of participants had a PSA  $\ge$  4.0 ng/ml. This prevalence is higher than that found by Mettling<sup>11</sup> in a study from the United States where 13% of a population of 2996 men aged 55 to 70 years had a high PSA value. In Japan, Egawa et al<sup>12</sup> and Uchida et al<sup>13</sup> found a lower prevalence of PSA  $\geq$  4.0 ng/ml in screened populations, reporting that 3.6% of 1227 men aged 55 years or older had a PSA  $\ge$  4.0 ng/ml, and 5.6% of a population of 899 men had a PSA  $\ge$  4.0 ng/ml, respectively. One limitation of our study is the small number of participants compared to these other studies. However, with a small sample, we were unable to detect differences in PSA by demographic variables. Our study should be continued to include more participants and perhaps other variables (i.e. body mass index, diet) that may help to identify men at highest risk for prostate cancer.

#### Conclusion

A wider use of PSA testing in this population could lead to the detection of more prostate cancer cases. Even more

important, we need to determine PSA cut-off values specific to this population. Some authors suggest there is a need to adjust PSA cut-off values for ethnic groups other than white men. Discussions about ways to effectively treat prostate cancer in developing countries are still needed. However, such conversations may suggest that men who are found to have high PSA values should undergo follow-up examinations that include a repeat PSA test and a prostate biopsy, to better assess the place of PSA screening in the early detection of prostate cancer.

#### References

- 1. Smith DP, Armstrong BK. Prostate Specific Antigen testing and association with prostate cancer incidence in New South Wales. *Medical Journal of Australia* 1998;169:17-20.
- 2. Bartsch G, Horninger W, Klocker H et al. Prostate cancer mortality after introduction of Prostate-Specific Antigen mass screening in the federal of Tyrol, Austria. *Urology* 2001;58:417-424.
- 3. US Cancer Statistics Working Group. United States Cancer Statistics: 1999-2004 Incidence and Mortality Web-based Report. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute;2007. Available at www.cdc.gov/uscs
- 4. Sakr WA, Haas GP, Cassin BF et al. The frequency of carcinoma and intraepithelial neoplasia of prostate in young male patients. *J Urol* 1993;150:379-385.
- Kobayashi T, Kinoshita H, Nishizawa K, Mitsumori K, Ogawa O, Kamoto T. Age-associated increase of prostate-specific antigen in a high level of men existing urological clinics. *Int J Urol* 2005;12(8):733-738.
- 6. Lee SE, Kwak C, Park MS, Lee CH, Kang W, Oh SJ. Ethnic differences in the age-related distribution of serum prostate specific antigen values: a study in a healthy Korean male population. *Urology* 2000;56(6):1007-1010.
- Spurgeon SE, Mongoue-Tchokote S, Collins L, Priest R, Hsieh YC, Peters LM, Beer, TM, Mori M, Garzotto M. Assessment of prostate-specific antigen doubling time in prediction of prostate cancer on needle biopsy. *Urology* 2007;69(5):931-935.
- Suzuki H, Komiya A, Kamiya N, Imamoto T, Kawamura K, Miura J, Suzuki N, Nakatsu H, Hata A, Ichikawa T. Development of a nomogram to predict probability of positive initial prostate biopsy among Japanese patients. *Urology* 2006;67(1):131-136.
- 9. Oesterling JE, Cooner WH, Jacobsen SJ et al. Influence of patient age on the serum PSA concentration: an important clinical observation. *Urol Clin North Am* 1993;20:671-680.
- 10. Caplan A, Kratz A. Prostate-specific antigen and the early diagnosis of prostate cancer. *Am J Clin Pathol* 2002;117(Suppl):S104-S108.
- 11. Mettlin C, Murphy GP, Babaian RJ, Chesley A, Kane RA, Littrup PJ, Mostofi FK, Ray PS, Shanberg AM, Toi A. The results of a five-year early prostate cancer detection intervention. Investigators of the American Cancer Society National Prostate Cancer Detection Project. *Cancer* 1996;77(1):150-159.
- 12. Egawa S, Suyama K, Kawakami T, Ohori M, Kuwao S, Hirokado K, Hirano S, Uchida T, Yokoyama E, Koshiba K. Early detection of prostate cancer-results of a prostate specific antigen-based detection program at a "multiphasic screening". *Nippon Hinyokika Gakkai Zasshi* 1995;86(12):1711-1719.
- Uchida K, Akaza H. Characteristics of screening-detected prostate cancer on health checkup. Gan To Kagaku Ryoho 1998;25(10):1527-1532.