Original Article

Prostate Cancer Detected by Screening in a Semi Urban Community in Southeast Nigeria: Correlations and Associations between Anthropometric Measurements and Prostate-specific Antigen

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Abstract

Context: Prostate cancer (PCa) is frequently diagnosed at advanced stages in Nigeria. **Aims:** To determine the screen detected PCa prevalence in a suburban community and explore any relationships between prostate-specific antigen (PSA) and anthropometric measurements. **Settings and Design:** Nsukka is a town and local government area (LGA) in Southeast Nigeria in Enugu State. Towns that share a common border with Nsukka are Edem Ani, Alor-uno, Opi, Orba, and Ede-Oballa. Nsukka LGA has an area of 1810 km² and a population of 309,633 at the 2006 census. All consecutive responders who met the inclusion criteria were recruited. **Subjects and Methods:** A screening outreach was conducted in one location in Nsukka. PSA testing and digital rectal examinations were performed. Height and weight were measured and body mass index (BMI) was calculated. **Statistical Analysis Used:** Results were subjected to statistical analysis using SPSS 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY, USA). Categorical data were analyzed using the Chi-square test, with significance level set at $P < 0.05$. Pearson's correlation was conducted for interval data ($P < 0.05$). **Results:** One-hundred and sixty men met the inclusion criteria and were screened. Age range was 40–81 years; PSA range was 1.20–33.9 ng/ml. Digital rectal examinations (DREs) was abnormal in 17 men. Median BMI was 27.49. A Pearson's correlation coefficient showed a significant correlation between age and PSA, $r = 0.127$; $P \leq 0.05$, and DRE findings and PSA, $r = 0.178$; $P \leq 0.05$. There was no significant correlation between height and PSA, $r = -0.99$; $P = 0.211$; weight and PSA, $r = -0.81$ $P = 0.308$; and BMI and PSA, $r = -0.066$; $P = 0.407$. 8/21 men consented to prostate biopsy with three positive, giving a screen detected PCa prevalence of 1.875%. **Conclusions:** Screen detected PCa prevalence in high this population and efforts to improve early detection may be of value in improving treatment outcomes.

Keywords: *Body mass index, Nigeria, prostate cancer, prostate-specific antigen, screen*

Introduction

Prostate cancer (PCa) incidence has been reported to be highest among African-American men,[1,2] up to 195.3/100,000 men years.[3] Rates based on cancer registry figures ranging from 19.8/100,000 men years to 37.6/100,000 men years from Nigeria in West Africa to Uganda in East Africa have been reported.[3] It is thought that these figures may actually be higher in reality but for some challenges such as differences in medical care access, cancer registry quality, completeness of case assessment, estimates of populations at risk, and screening practices.[4]

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There is evidence indicating a high incidence of PCa from hospital-based series which show a similarity in late presentation at high stage and associated significant morbidity and mortality. These publications are largely in agreement in recommending earlier diagnosis to allow greater treatment success.[5-8]

Given these trends, we saw the need for enhanced enlightenment and community-based screening to allow the determination of PCa prevalence in a community setting and explore any relationship between age, height, weight, and body mass index (BMI). We conducted an enlightenment and screening outreach to a community, targeting men ≥40 years without a known previous diagnosis of PCa.

Subjects and Methods

Setting

Nsukka is a town and local government area (LGA) in Southeast Nigeria in Enugu State. Towns that share a common border with Nsukka are Edem Ani, Alor-uno, Opi, Orba, and Ede-Oballa.[9]

Nsukka LGA has an area of 1810 km² and a population of 309,633 at the 2006 census. Nsukka town is the site of the University of Nigeria.[9] Residents are mostly farmers or traders except those employed as public servants, some of whom work at the university.

Study subjects

All the participants were resident in Nsukka and environs and were all Nigerians of the Igbo ethnic group. All consecutive responders who met the inclusion criteria were recruited.

Ethics

Ethical clearance was sought and obtained from the Ethics Committee of the University of Nigeria Teaching Hospital.

Procedure

All men ≥40 years old living in and around the University of Nigeria Nsukka Campus without previous diagnosis of PCa were invited for enlightenment and screening exercise for PCa. This was preceded by enlightenment talks on PCa on the local community radio station (Lion FM). Information leaflets and posters were circulated. Announcements were also made in churches and mosques.

A PowerPoint® health talk lasting 30 min and containing illustrations on PCa was delivered, especially its high incidence in blacks, risk factors, treatments, and follow-up. A question and answer session was followed.

Thereafter, and in private, bio data were obtained; height and weight were measured with a stadiometer. Venous blood for quantitative prostate-specific antigen (PSA) was taken and stored in a refrigerated container for transportation to the laboratory on the same day. Thereafter, digital rectal examinations (DREs) were performed by an experienced urologist and findings documented on a pro forma.

Where elevated PSA and/or abnormal DRE were found, attendees were invited, counseled, and informed consent obtained for prostate biopsy.

Statistical analysis

Results were subjected to statistical analysis using SPSS 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY, USA). Demographic data were analyzed as frequencies and percentages. Age and PSA level were transformed to allow presentation (as grouped data). Computed BMI was calculated using SPSS. Categorical data were analyzed using the Chi-square test with significance level set at $P < 0.05$. Pearson's correlation was conducted for interval data ($P < 0.05$).

Results

One-hundred and sixty men were screened during this exercise. A normality test using Shapiro–Wilk test ($P > 0.05$) with visual inspection of box plots, and Q-Q plots showed that age, height, calculated BMI, and PSA were normally distributed.

Age range was 40–81 years, median 55.456, 73.2% ≥50 years old. Height was 1.50–1.90 m (mean 1.704), standard deviation 0.06. PSA range was 1.20–33.9 ng/ml, with a median of 2 ng/ml (minimum = 1, 2 ng/ml, maximum = 33.9 ng/ml, interquartile range [IQR] =1.51 ng/ml) [Table 1].

DRE was normal in 143 men, abnormal in 17 [Table 2]. Median BMI was 27.49 (IQR 3.26).

There was no significant association between computed BMI and level of PSA obtained (Pearson's Chi-square; $P = 0.479$).

A Pearson's correlation coefficient showed a significant correlation between age and PSA, $r = 0.127$; $P \leq 0.05$, and DRE findings and PSA, $r = 0.178$; $P \leq 0.05$. There was no significant correlation between height and PSA, $r = -0.99$; $P = 0.211$; weight and PSA, $r = -0.81$ $P = 0.308$; and BMI and PSA, $r = -0.066$; $P = 0.407$.

To test the hypothesis that BMI category had an effect on PSA level, a between groups one-way ANOVA was performed. Prior to performing the ANOVA, the assumption of homogeneity of variances was tested and satisfied based on Levene's F-test, F (2, 157) = 0.43, $P = 0.65$ The independent between groups one-way ANOVA yielded no statistically significant effect, F (2, 157) = 0.146, $P = 0.864$, for BMI.

Table 1: Cross-tabulation of prostate-specific antigen levels by age categories

Age groups	PSA categories									
	1.1-1.9		2-2.9		3-3.9		>5		Column total	
	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %
37-40	0	0	2	28.6	5	71.4	0	0	7	100.0
40-49	20	57.1	4	11.4	10	28.6	1	2.9	35	100.0
50-59	35	50.0	12	17.1	14	20.0	9	12.9	70	100.0
60-69	12	35.3	5	14.7	12	35.3	5	14.7	34	100.0
70-79	4	30.8	1	7.7	2	15.4	6	46.2	13	100.0
80-89	1	100.0	0	0	0	0	0	0	1	100.0
Row total	72	45.0	24	15.0	43	26.9	21	13.1	160	100.0

PSA: Prostate-specific antigen

Table 2: Cross-tabulation of digital rectal examinations findings against prostate-specific antigen categories

DRE findings	PSA categories									
	1.1-1.9		2-2.9		3-3.9		>5		Column total	
	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %	Count	Row *n*, %
Normal	64	44.8	24	16.8	40	28.0	15	10.5	143	100.0
Abnormal	8	47.1	0	0	3	17.6	6	35.3	17	100.0
Row total	72	45.0	24	15.0	43	26.9	21	13.1	160	100.0

PSA: Prostate-specific antigen, DRE: Digital rectal examination

Positive screening by PSA and DRE occurred in 21/160 (13.1%) and 16/160 (10%), respectively.

Biopsies were taken in eight persons who responded to invitation and consented to the procedure. Three returned as adenocarcinoma of the prostate giving a screen detected PCa prevalence of 1.875%.

Discussion

The burden of cancer is increasing in Africa because of the aging and growth of the population as well as increased prevalence of risk factors associated with economic transition.[10]

PCa rates as high as 22.2/100,000 men years have been reported for West Africa rising to 53.9/100,000 men years in Southern Africa.[11] Opportunities for reducing suffering and death from cancer in Africa exist across all stages of the cancer control spectrum, from prevention to early detection, treatment, and palliative care.[10,12] In Nigeria, PCa is the most common cancer in men[13] and awareness of the disease is low.[14]

There is therefore a case to be made for enlightenment and screening in the hope that this would reduce the late presentation and associated poor outcome that is often associated with PCa in Nigeria.[15]

In this study, the age range was 40–81 years, median 54.45. About 73.2% of these men were >50 years old. This is similar to the findings of Ukoli *et al*.[16] but lower than that of Heyns *et al*.,[17] where the mean age was almost 60 years. This may be explained by national similarities as Heyns *et al*. studied a population in Southern Africa. Earlier workers have shown an inverse relationship between BMI and PSA.[18,19] Our data showed a strong negative association between height, weight, BMI, and PSA although this did not reach statistical significance and this may be attributable to our small sample population. This requires more investigation in a larger study as it may have implications for the interpretation of PSA values in clinical decision making. PSA values ranged from 1.2 ng/ml to 33.9 ng/ml and were similar to the findings of previous workers.[17] The finding of a significant positive association between age and PSA should be borne in mind in the interpretation of PSA in the clinical setting and may require the use other parameters to aid decision-making such as free-to-total PSA ratio and age-specific PSA.[17]

One-way ANOVA was used to test the hypotheses that BMI had an effect on PSA and this yielded no statistically significant effect. This relationship has been explored severally with varied findings;[20,21] these may however require greater scrutiny in a larger study to define if any relationships exist.

Abnormal DRE correlated significantly with PSA. This trend has been shown previously[16] and may suggest some value though less sensitive compared to PSA, in the use of DRE alone as a screening tool in very low-resource settings where PSA may not be available or affordable. Akinremi *et al*.[22] had shown an elevated PSA in 11.5% and abnormal DRE in 31.45% of men in their study population. Our findings of 13% elevated PSA was similar though the abnormal DRE of 10% was

lower, it was similar to the findings of Ikuerowo *et al*.[23] These findings may suggest some similarities nationally and are of concern regarding its implications concerning the potential curability of lesions that are diagnosed eventually. This study yielded a screen detected PCa rate of 1.875% which is similar to earlier findings of 1046% (1046/100,000 men ≥40 years)[23] but lower than 7% and 10% obtained in much larger series in Ghana and Tobago, respectively.[24,25]

This finding is of concern as perhaps the number may have been higher if all the invitations for biopsy were accepted, and a larger population screened.

Given that PCa continues to be diagnosed at an advanced stage in Nigeria, it may be necessary to consider adopting a screening strategy that may allow earlier detection.

Limitations

Our main study limitation was the number of subjects screened. Despite this, we believe that the findings could act as a snapshot and may offer some insight that could allow the planning of a larger study to address these.

Conclusion

Screen detected PCa prevalence in high in this population and efforts to improve earlier detection may be of value in improving treatment outcomes. A larger study is necessary to confirm these observations.

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Conflicts of interest

There are no conflicts of interest.

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