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Original Article

Prostate cancer screening among apparently healthy adult males

Emmanuel Kunle Abudu[1], Elijah Asuquo Udoh[2], Cecilia Ndiuwem Okuku[3], Okon Edet Akaiso[2], Ikwo Jonathan Kudamnya[1], Albert Effiong Ukpong[2], Unyime Aniekpon Fabian[3], Isaac Assam Udo[2], Olugbemi Oluseyi Motilewa[4], Olufisayo Gabriel Ayoade[3], Felix Uduma Uduma[5], Ifiok Udo Essiet[6], Collins Amadi[7], Isreal Mfon Ben[6], Ekpedeme Sunday Mkpouto[8], Oto-Obong Okpoho Peter[6], Collins Oscar Asuquo[8], Oluwasayo Omolara Abudu[9]

Departments of [1]Pathology, [2]Surgery, [3]Chemical Pathology, [4]Community Medicine and [5]Radiology, University of Uyo; Departments of [6]Surgery, [7]Chemical Pathology, [8]Radiology and [9]Nursing Services, University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria.

***Corresponding author:**
Emmanuel Kunle Abudu, Department of Pathology, University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria.

ekabudu@yahoo.com

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ABSTRACT

Objectives: This study is set to describe the outcome of tripod-based prostate cancer screening among apparently healthy adult males in tertiary academic and health institutions in Uyo, Akwa Ibom State, Nigeria.

Material and Methods: All consenting adult males aged 40 years and above who are staff of the University of Uyo and her teaching hospital were recruited and subjected to questionnaire-based survey, digital rectal examination (DRE), prostate-specific antigens analysis, and transrectal ultrasonography of prostate gland.

Results: A total of 201 participants with a mean age of 53.0 + 2.4 years were screened. The majority of the participants were in the 50–59 years of age group (47.8%). Twenty-eight (13.9%) had abnormal, suspicious DRE findings. The mean serum PSA levels were 2.4 ng/mL and 33.7 ng/mL in those with benign and suspicious DRE findings, respectively. Suspicious nodules for prostate cancer were diagnosed in 20 (9.6%) patients who had transrectal ultrasonography (TRUS) of the prostate gland. There was a positive correlation between age and other diagnostic variables, including findings of DRE, PSA, and TRUS.

Conclusion: A tripod of DRE, prostate-specific antigen (PSA) analysis, and transrectal ultrasonography of the prostate gland is still relevant as a step-wise prostate cancer screening strategy, prior to deployment of confirmatory prostate biopsy.

Keywords: Screening, Prostate cancer, Healthy males

INTRODUCTION

Despite the underreporting of cancer in our environment, cancer still remains a worrisome disease with psychological, economical, and prognostic burdens.[1-4] Reports have shown that the incidence of cancer is on the increase in North America, Europe, Asia, and Africa.[2,5,6] Among the most common cancers globally, prostate cancer remains the most common cancer in adult males with resultant poor prognosis and mortality.[2,3,5,7-13] In contrast to most literature, prostate cancer was the second and third most common cancer among men in Romania and Singapore.[4,14]

The increasing mortality associated with prostate cancer underscores the need for timely screening for risk factors for prostate cancer and possibly early detection and treatment of precancerous lesions and prostate cancer.[3,4,7,10-12,15]

Increasing age, red meat enriched diet, white meat enriched diet, smoking, vegetable impoverished diet, family history of prostate cancer, genetic mutations, fruit impoverished diet, prolonged alcohol consumption, dairy product-enriched diets, and decreased sexual activity have been reported as possible risk factors to the development of prostate cancer.[2,5-7,9,11-13,16-21]

Digital rectal examination (DRE) is still a valuable tool in the diagnosis of prostate cancer and shows enlarged nodular, hard-to-craggy prostate with obliterated median groove and sulci as well as fixed rectal mucosa suggestive of suspicious prostate cancer.[2,4-6,8,10,14,15,19,20,22-24]

Serum prostate-specific antigen (PSA) level, a tumor marker, has been used to predict men who are at risk of prostate cancer and determine the choice of medical treatment in benign prostatic hyperplasia (BPH).[7,8,10,14,19,20,25-31] The potential risk of false positivity or negativity of PSA may be associated with over-diagnosis, under-diagnosis, and overtreatment of prostate cancer as well as other prostatic lesions such as urinary tract infections, benign prostatic enlargement (BPE), acute and chronic urinary retention and prostatic trauma from trucut diagnostic biopsy or vigorous DRE may produce raised PSA.[7,12,14,15] It is pertinent to observe that transrectal ultrasonography (TRUS) of the prostate plays a crucial role in increasing the detection rate of prostate cancer among other mimicking prostatic lesions alongside other complimentary diagnostic tools, including transrectal ultrasound-guided prostate biopsy, PSA, and DRE.[4,6,9,13,14,19,26,27]

Transrectal ultrasound-guided prostate biopsy is the gold standard for diagnosis of prostate cancer, as reported in many studies.[2,5,6,8,9,11,14,19,25-27] Notwithstanding the usefulness of prostate biopsy, it could be limited by inadequate sample size and technical expertise of the medical laboratory scientist, radiologist, and pathologist.[19,26-28] It is important to scale up screening for prostate cancer among males aged 40 years and above aimed at detecting precancerous lesions such as prostatic intraepithelial neoplasia and atypical small acinar proliferation as well as frank prostate cancer.[11,14,29,30]

Health education of the populace to expose misinformation and strengthen the pursuit of early diagnosis and treatment of diseases, including prostate cancer, should be prioritized by health-care workers, government, and non-governmental organizations.[4,10,15]

This study is aimed at describing the outcome of tripod-based prostate cancer screening among apparently healthy adult males in tertiary academic and health institutions in Uyo, Akwa Ibom State, Nigeria, with a view to highlighting the need for targeted screening of the disease in the community.

MATERIAL AND METHODS

Study design

This was a prospective, cross-sectional, single-center, collaborative, multidisciplinary study carried out between November 01, 2021, and May 31, 2022, in the University of Uyo Teaching Hospital, Uyo, Akwa Ibom State.

Study setting

The study location is a Referral hospital that runs a busy Urology Surgical Out-Patient Clinic domiciled in the Department of Surgery that operates thrice a week with an average daily attendance of 120 patients.

Study population

All consenting adult males working in the University of Uyo and the university of Uyo Teaching Hospital aged 40 years and above who were invited and attended all recommended phases of the screening during the studied period were recruited into the study.

Inclusion criteria

The following inclusion criteria were used in selecting participants for the study:

1. Consenting adult male staff of the university of Uyo and University of Uyo Teaching Hospital who were aged 40 years and older
2. Persons who have not been diagnosed with prostate cancer previously
3. Participants who were not oncologic patients or receiving treatment for prostate cancer
4. Participants were available and eligible for recommended phases of screening ranging from questionnaire history taking, DRE, blood sample collection for prostate-specific antigens (PSA) estimation, and transrectal ultrasonography of the prostate
5. Adult males without contraindications to transrectal ultrasonography such as peri-anal infections and hemorrhoids.

Exclusion criteria

The following exclusion criteria were used in rejecting participants for the study:

1. The Non-consenting adult male staff of the University of Uyo and Teaching Hospital who were younger than 40 years
2. Persons who have been diagnosed with prostate cancer previously or already receiving treatment for prostate cancer
3. Participants who were not available or eligible for any

of the recommended phases of screening, including questionnaire-based history taking, DRE, blood sample collection for prostate-specific antigens (PSA) estimation, and transrectal ultrasonography of the prostate
4. Persons with contraindications to transrectal ultrasonography, such as peri-anal infections and hemorrhoids
5. Persons who were not fit for serum PSA analysis namely: Those who have had a recent DRE, urethral instrumentation, perineal trauma, and sexual intercourse within the previous 2 weeks.

Sample size estimation

Consenting participants were recruited by random sampling and the sample size was estimated using the formula: $n = z^2pq/d^2$ (where: n = desired sample size when population >10,000, z = level of significance at 95% confidence interval [CI =1.96], p = proportion of the study population who are aware of prostate cancer and screening from similar previous study = 0.22 [31], $q = 1–p = 0.78$ and d = degree of accuracy desired, usually set at 0.05).

Sample size (n) = z^2pq/d^2 = (1.96) 2 × (0.22) × (0.78)/(0.05) 2 = 3.84 × 0.22 × 0.78/0.0025 = 0.6589/0.0025 = 264. The minimum sample size required for this study was reduced from 264 to 250 for convenience as well as a necessity to reduce the impact of the spread of 4th and 5th waves of the outbreak of the COVID-19 pandemic. Therefore, the sample size was 250 participants.

Participants were stratified in interval age groups of 40–49, 50–59, 60–69, 70–79 years, and 80 years and above.

Study procedure

Data on socio-demographic characteristics were collected through semi-structured questionnaires. Blood samples of participants were drawn and taken to the laboratory for serum PSA estimation. In addition, transrectal ultrasonography (TRUS) was done for all participants at the Radiology Department. The demographic parameters of the patients were recorded. The serum PSA was analyzed by ELISA method using kits manufactured by Bios incorporated USA.

Statistical analysis

The data were collated using Microsoft Excel. Descriptive and Inferential analysis was performed using a statistical package for social sciences version 20 (Chicago, IL, United States). Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to summarize the qualitative and quantitative variables, depicted in tables. Inferential statistics (Chi-square, *t*-test, Fischer's exact test, and Pearson's r-test) were used to explore the association between two or more variables. CI of 95% was used while $P \leq 0.05$ was considered statistically significant.

Ethical consideration

Ethical approval to conduct the study was obtained from the Health Research and Ethics Committee of the University of Uyo Teaching Hospital (UUTH/HREC/PR/2020/01/01). Written informed consent was obtained from all participants before embarking on the study. Brief education on the purpose and nature of the study was given to all respondents. All respondents were assigned a unique code to ensure confidentiality. Only the lead researcher had access to the information linking the identity of the study respondents to the study codes to ensure anonymity and prevent stigmatization. Participants were reliably informed that the information provided shall be strictly kept secret, and he is at liberty to withdraw from the study at any time they wished without any negative consequences to them. The study was fully self-sponsored by the Tertiary Education Trust Fund for an institution-based study.

RESULTS

Sociodemographic characteristics

Of a total of 250 consecutive men who were invited, 201 (80.4%) with ages ranging from 40 to 71 years were screened. The mean age was 53.0 + 2.4 years and 79 (47.8%) participants were >50 years of age, with the 50–59 years of age group having the highest frequency (47.8%) [Table 1]. A significant majority of the participants were university staff (69.2%), with lecturers accounting for most of them (n = 117, 58.2%), many of whom have PhD as the highest university education (60.7%). Hospital administrative staff and non-academic university staff accounted for 13.9% and 11.0% of the total participants, respectively. Christianity was the most preponderant religion (96.0%). Islam and Eckankar accounted for 2.5% and 1.5% of other religions, respectively.

Knowledge of risk factors for prostate cancer

Among participants, 65.7% were not knowledgeable about the risk factors of prostate cancer, whereas 34.3% of respondents were knowledgeable of the risk factors for prostate cancer. The majority of the participants correctly acknowledged the red meat-enriched diet as the main contributory risk factor (n = 21; 30.4%). Eleven participants identified a white meat-enriched diet as the 2nd leading risk factor (15.9 %) [Table 2].

DRE findings

Of the 201 apparently healthy participants screened, 28 (13.9%) had abnormal findings ranging from nodular enlargement, hard consistency, obliterated median groove,

Table 1: Socio-demographic of participants.

Variables	Prostate disease *n* (%)		*P*-value
	Malignant (*n*=6) 3.0%	Benign (*n*=195) 97.0%	
Age (years)			
40–49	0 (0.0)	67 (100.0)	<0.0001*
50–59	1 (1.0)	95 (99.0)	
60–69	5 (13.9)	31 (86.1)	
70–79	0 (0.0)	2 (100.0)	
Mean (SD)	61.7 (±2.4)	52.9 (±2.4)	<0.0001#
Marital status			
Single	0 (0.0)	14 (100.0)	1.000*
Married	5 (2.9)	169 (97.1)	
Separated	0 (0.0)	7 (100.0)	
Widower	1 (16.7)	5 (83.3)	
Occupation			
University lecturer	5 (4.3)	112 (95.7)	<0.0001*
Hospital administrator	0 (0.0)	28 (100.0)	
Non-academic university staff	1 (4.5)	21 (95.5)	
Medical laboratory scientist	0 (0.0)	13 (100.0)	
Accountant	0 (0.0)	10 (100.0)	
Pharmacist	0 (0.0)	3 (100.0)	
Records officer	0 (0.0)	3 (100.0)	
Physiotherapist	0 (0.0)	2 (100.0)	
Driver	0 (0.0)	2 (100.0)	
Health attendants	0 (0.0)	1 (100.0)	

*Chi-square test, #Independent samples t-test. *P*<0.05 is statistically significant while *P*<0.001 is highly significant. SD: Standard deviation

and sulci on DRE suspicious of a prostate cancer, whereas 173 participants had findings suggestive of either benign enlargement or normal sized features (86.1%).

Prostate-specific Antigen (PSA) findings

Prostate-specific antigen (PSA) range was 0.10–65.3 ng/mL, with a mean of 2.5 ng/mL. The majority (*n* = 165, 82.0%) of the participants had serum PSA levels ≤ 4 ng/mL. PSA values >4.0–≤10 ng/mL was seen in 15 (7.5%) participants, values >10 ng/mL–≤20 ng/mL were seen in 12 (6.0%) participants, and values >20 ng/mL were seen 9 (4.5%) participants [Table 3]. The mean and median (range) serum PSA levels in those with benign DRE findings were 2.4 and 1.4 (0.1–41.1) ng/mL, respectively, whereas those with suspicious DRE findings had 33.7 and 23.3 (10.9– 65.3) ng/mL, respectively.

Transrectal ultrasonography (TRUS)

Most (*n* = 89, 44.3%) of the participants had TRUS prostate volume ranging from 26 mLs to 50 mLs. This was closely followed by prostate volume of 25 mLs and below recorded in 80 participants (39.8%) [Table 3]. The mean and median prostate volumes in those with benign TRUS findings were 60.0 mLs and 27.5 mLs, respectively, whereas similar volumes for those suspicious TRUS findings were 66.9 mLs and 53.6 mLs, respectively. Of these, 91 (45.3%) had features of benign nodules, and 20 (9.6%) had suspicious nodules for prostate cancer. The remaining 90 (44.8%) participants had normal findings without nodules or enlargement.

Table 2: Distribution of those respondents who were knowledgeable about identifiable risk factors to prostate cancer.

Risk factors	Total number of respondents (*n*)	Percentage
Red meat enriched diet	21	30.4
White meat enriched diet	11	15.9
Vegetable impoverished diet	9	13.0
Cigarette smoking	8	11.6
Family history of cancer	5	7.3
Fruit impoverished diets	5	7.3
Alcohol consumption	5	7.3
Dairy products (cow milk) enrich diet	3	4.3
Sexual intercourse	2	2.9
Total	69	100.0

Age, DRE, PSA, and TRUS findings and their relationship

Participants who had suspicious DRE findings were significantly older than those with benign DRE findings ($P < 0.0001$). It was observed that those with suspicious DRE findings have a higher PSA value compared to those with benign DRE findings ($P < 0.0001$). The mean serum PSA level of those with suspicious DRE findings was 33.7 ng/mL, and it was significantly higher than those with benign DRE findings, having a mean PSA level of 2.4 ng/mL ($P < 0.0001$). It was observed that the outline of the prostate during TRUS assessment differs significantly; those having findings of suspicion of prostate cancer have a high proportion of lobulated outlined prostate, whereas benign prostatic lesions have a higher proportion of regular outlined prostate ($P < 0.0001$). The mean prostatic volume of those suspicious for prostate cancer was 60.0 mLs, and it was significantly lower than those without prostate cancer with the mean prostate volume of 66.9 mLs ($P = 0.012$) [Table 3].

DISCUSSION

The burden of cancer is still on the increase in Europe, Asia, and Africa, including Nigeria, which may be attributed to the aging and growth of the population as well as the increased prevalence of risk factors associated with the adoption of unhealthy to affluent lifestyle.[1-6] Although prostate cancer remains the most common cancer in adult males in most countries with resultant poor prognosis and mortality,[2,3,5,7-13]

Table 3: The distribution of ultrasonographic findings among the respondents.

Ultrasound findings	Frequency, *n* (%)	*P*-value
Echo pattern		
Homogeneous	108 (53.7)	0.001*
Heterogeneous	74 (36.8)	
Hyperechoic	12 (6.0)	
Hypoechoic	7 (3.5)	
Prostate outline		
Lobulated	37 (18.4)	<0.0001*
Regular	164 (81.6)	
Prostate volume		
<25	80 (39.8)	0.012#
25–50	89 (44.3)	
>50–75	25 (12.4)	
>75–100	5 (2.5)	
>100	2 (1.0)	
Mean (range, mLs)	63.5 (13.3–152.9)	
Post micturition volume	82.8 (0.26–376.2)	0.005#
Median (range)		

*Chi-square test, #Independent samples t-test. *P*<0.05 is statistically significant while *P*<0.001 is highly significant.

there are still a few contrasting results of prostate cancer being the second and third leading cancer among men in Romania and Singapore, respectively.[4,14] Thus, the varying prevalent rates of cancer could be explained by sample size, racial, cultural, and geo-political differences, which further underscore the need for timely screening for risk factors for prostate cancer as well as early detection and treatment of prostate cancer.[3,4,7,10-12,15-25] The index study recorded a mean age of 53.0 ± 2.4 years, which agrees with the preponderant of participants who were above the age of 50 years and fell largely within the age group of 50–59 years (47.8%). These findings compare also with the results of other studies.[2,5,9,23] Ugwumba *et al*. in Enugu reported that most participants had a median age of 55.5 years and were ≥50-years-old (73.2%).[2] Ikuerowo *et al*. in Lagos, South Western Nigeria, Ogbetere and Irekpita in Benin, South-South Nigeria and Ngwu *et al*. in Umuahia, South Eastern Nigeria, recorded mean ages of 60.8, 69.8, and 71.3 years, Respectively, which were higher than the values recorded in the index study.[5,9,19] Similarly, Lauro in Mexico, Walsh *et al*. in the UK, Lim *et al*. in the USA, Lee *et al*. in Singapone and Jia *et al*. in China reported mean ages of 61.9 years, 63.3 years, 64.2 years, and 68.2 years and 73.5 years respectively.[13-15,25,26] On the other hand, Ukoli *et al*. in Nigeria reported a mean age of 56.45 + 15.1 years among rural men and preponderance among participants who were ≥50 years of age (61.6%).[20] In contrast to most studies, Ogbetere and Irekpita reported the peak age range for the participants to be 70–79 years, which is higher than the finding in the index study.[19] The preference for screening of men aged 40 years and above by aforementioned studies is supported by the fact that prostate cancer is more likely to develop in older men, and the risk of developing the cancer increases gradually from age 40.[6,7,12] Furthermore, it is obvious that age still remains the strongest risk factor for prostate cancer, and the predominant age group of participants may vary from region to region, and there is a likely possibility that the level of education among participants may have a positive influence on prompt uptake of screening for the prostate cancer.[6,12,18,19]

Red meat- and white meat-enriched diets were the two leading identifiable risk factors in 30.4% and 15.9% of participants, respectively. Consequently, it is pertinent to highlight the role of variable socioeconomic factors in the process of development of prostate cancer. These risk factors include red meat enriched diet, white meat enriched diet, smoking, vegetable impoverished diet, family history of prostate cancer, genetic mutations, fruit impoverished diet, prolonged alcohol consumption, dairy product enriched diets, and increased sexual activity.[2,5-7,9,11-13,16-20,21] Furthermore, other contributing factors to the development of prostate cancer may include poverty, cultural beliefs, delay in accessing medical care, poor cancer registry quality, difficulty in completing case assessment, estimation of populations at risk, and poor uptake of screening practices.[2,11] Health education of the populace to strengthen the pursuit of early diagnosis and treatment of diseases, including cancer, should be prioritized by health-care workers, government, and non-governmental organizations.

In the index study, 28 (13.9%) participants had abnormal DRE findings suspicious of a prostate cancer, whereas the remaining 86.1% of participants had findings suggestive of either benign enlargement or normal-sized features. This compares relatively with a study by Aisuodionoe-Shadrach *et al*. in Abuja, who reported that six participants had abnormal findings on DRE suggestive of a prostate malignancy.[7] Akinremi *et al*. in Abeokuta recorded that 31.4% of the participants showed some DRE abnormalities ranging between various degrees of enlargement and nodularity.[10] Ukoli *et al*. also reported that 29.0% of participants had an enlarged prostate, including 2 participants who had nodular prostate.[20] Walsh *et al*. reported that DRE abnormalities in referred clients were observed by general practitioners (GPs) and Urologists in the UK in 72% and 58%, respectively.[15]

Features of abnormal DRE findings suspicious of prostate cancer have been described and are usually characterized by nodular enlargement, hard to craggy consistency, obliterated median groove and sulci, as well as fixed rectal mucosa.[2,4-6,8,10,14,15,19,20,22,23] From the foregoing, although DRE is still a valuable tool in the diagnosis of prostate cancer, expertise is however required to avert mis- or under-diagnosis of prostate lesions.[3,7] In addition, the importance

of DRE in the detection of higher-grade, clinically aggressive prostate cancer has been described.[15,19,22,23]

In the index study, prostatic-specific antigen (PSA values ≤4.0 ng/mL were seen in the majority of participants (82.0%), values >4.0–≤10 ng/mL were seen in 7.5% of the participants, and values >10 ng/mL were seen in 10.5% of the participants. Although the overall mean serum PSA level for all participants was 2.5 ng/mL, which is higher than 2.4 ng/mL recorded in those with benign DRE findings and higher than 33.7 ng/mL reported in those with suspicious DRE findings. These findings compare relatively with a mean serum PSA level of 36.6 ng/mL in those with suspicious DRE findings reported by Ogbetere and Irekpita[19] and results of PSA values <4 ng/mL were mostly recorded by Okuja *et al*. and Aisuodionoe-Shadrach *et al*. in 78.3% and 91.0%, respectively.[7,8] Similarly, Akinremi *et al*. and Ukoli *et al*. reported that 11.2% and 27.0% of all the screened men had PSA ≥4 ng/mL, respectively.[10,20] Studies have shown that levels of serum prostate-specific antigen (PSA), a tumor marker, could be used to predict men who are at risk of prostate cancer and determine the choice of medical treatment in BPH.[7,8,10,14,19,20] Although reference interval values are a cutoff point for making further diagnostic evaluation and clinical treatment decisions, it is pertinent to establish local reference intervals peculiar to our environment aimed at averting potential risk of false positivity or negativity associated with consequences of over-diagnosis, under-diagnosis, and overtreatment of prostatic carcinoma.[7,23,32,33] Furthermore, it has been reported that elevated serum PSA levels are not limited to prostatic carcinoma but are also found in benign conditions such as urinary tract infections, BPE, acute and chronic urinary retention, and prostatic trauma from trucut diagnostic biopsy or vigorous DRE.[7,12,14,15,19,23,24] Thus, the patients with elevated serum PSA levels may be subjected to further collaborative diagnostic investigations, including transrectal ultrasound scan of the prostate (TRUS) and transrectal ultrasound scan-guided prostate biopsy to rule out differential diagnoses of elevated PSA levels.[4,6,9,13,14,19]

In our study, most of the participants had TRUS prostate volume between 25 and 50 mLs (44.3%) with features of benign and suspicious nodules in 44.3% and 9.6% of the participants, respectively. These findings compare relatively with a finding of a study conducted by Okuja *et al*. in Uganda, which recorded prostate volume ranging from 25 mLs to 50 mLs to be the predominant volume (56.0%) and detection of benign and suspicious nodules in 77.0% and 23.0% of participants respectively, though higher than the values recorded in the index study.[8] We observed that the mean prostatic volume of participants with suspicious for prostate cancer was significantly higher than those with benign prostate lesions, which is in agreement with a study by Ogbetere and Irekpita[19] It is pertinent to observe that TRUS of the prostate plays a crucial role in increasing the detection rate of prostate cancer among other prostate lesions alongside other important diagnostic tools, including transrectal ultrasound scan-guided prostate biopsy, PSA, and DRE.

Our study showed a significant relationship between variables such as age, DRE, PSA levels, and TRUS findings, thus highlighting their roles in prostate cancer screening as complementary to prostate biopsy.[9] Furthermore, it has been recommended that screening should commence in adult males from the age of 40 years to stem down morbidity and mortality related to prostate cancer.[12]

It is pertinent to note that there are controversies surrounding screening for prostate cancer. Criticisms of prostate cancer screening include the financial burden of screening, the morbidity of prostate biopsy, the low positive predictive value of screening, the over-treatment of an indolent disease, and the lack of evidence demonstrating a mortality benefit due to screening.[34] Nevertheless, there are still some strong points in support of screening for prostate cancer in our environment. They include the assertion that black Africans are at higher risk of developing prostate cancer due to the prevalence of some predisposing genetic or gene mutations such as BRCA, lynch syndrome, and HPC genes 1 and 2. In addition, most screening protocols have adopted a tripod of DRE, PSA, and TRUS as deployed in the index study and disregarded the sole use of PSA for prostate cancer. Furthermore, higher imaging approaches to the diagnosis of prostate cancer, such as multi-parametric magnetic resonance imaging (MRI), which combines anatomic T2-weighted imaging and T1 weighted with magnetic resonance spectroscopic imaging, diffuse-weighted imaging and/or dynamic contrast-enhanced MRI as well as ultrasound fusion techniques and MRI fusion-targeted biopsy have been deployed commonly in developed countries to improve the early detection of prostate cancer.[35] Unfortunately, these imaging techniques are not available in our center due to cost implications and technicalities as drawbacks. In addition, concerted efforts of all stakeholders should be directed towards early diagnosis of prostatic lesions and prompt treatment as well as provision of funds for a highly subsidized, targeted screening entailing DRE, PSA, TRUS of prostate and transrectal ultrasound-guided prostate biopsy.

CONCLUSION

Tripod of DRE, prostate-specific antigen (PSA) analysis, and transrectal ultrasonography of the prostate are still relevant in a stepwise prostate cancer screening before deployment of confirmatory prostate biopsy. Thus, it is important to scale up screening for prostate cancer among males aged 40 years and above for subjecting subjects with suspicious findings to confirmatory prostate biopsy. In addition, health education of the populace to expose misinformation and strengthen

the pursuit of early diagnosis and treatment of prostate diseases, including prostate cancer, should be prioritized by health-care workers, government, and non-governmental organizations.

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Ethical approval

The study approved by the Health Research and Ethics Committee of the University of Uyo Teaching Hospital, number (UUTH/HREC/PR/2020/01/01).

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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