Journal of Surgery
Oseni OA et al. J Surg 11: 11629
www.doi.org/10.29011/2575-9760.11629
www.gavinpublishers.com
Research Article

Assessment of Cancer Detection Rate of Mri Guided Prostate Biopsy in Relation to Prostate Imaging Reporting and Data System at Lagos University Teaching Hospital

Olukayode A Oseni[1*], Abraham T Oladimeji[2], Moses A Ogunjimi[3]

[1]Department of Surgery, Lagos University Teaching Hospital, Lagos, Nigeria

[2]Department of Surgery, Federal Medical Centre, Ebute Metta, Lagos, Nigeria

[3]College of Medicine, University of Lagos, Lagos, Nigeria

***Corresponding Author:** Olukayode A. Oseni, Department of Surgery, Lagos University Teaching Hospital, Lagos, Nigeria

Citation: Oseni OA, Oladimeji AT, Ogunjimi MA (2026) Assessment of Cancer Detection Rate of Mri Guided Prostate Biopsy in Relation to Prostate Imaging Reporting and Data System at Lagos University Teaching Hospital J Surg 11: 11629 DOI: 10.29011/2575-9760.011629.

Received Date: 15 May 2026; **Accepted Date:** 22 May 2026; **Published Date:** 25 May 2026

Abstract

Introduction: Prostate cancer is the second most common cancer in men worldwide. Prostate cancer screening protocols includes the use of serum prostate specific antigen assay and digital rectal examination. Diagnosis of prostate cancer is usually confirmed through histopathologic examination of prostate biopsy specimen. Studies have shown that MRI-guided prostate biopsy (MRGB) improves the detection rates of clinically significant prostate cancer. This study aims to evaluate the detection rates of prostate cancer for magnetic resonance imaging-guided prostate biopsy related to Prostate Imaging Reporting and Data System score.

Materials and Methods: This was a prospective observational cross-sectional study involving patients undergoing evaluation for prostate cancer at Lagos University Teaching Hospital between February 2024 to March 2025. Those who met the indication for prostate biopsy underwent a pre-biopsy multiparametric magnetic resonance imaging (mp-MRI); to detect any suspicious lesions using prostate imaging reporting and data system (PIRADS) score. Subsequently, a cognitive targeted Trans Rectal Ultrasound (TRUS)-guided prostate biopsy was done by targeting any suspicious areas. Data was analysed using Statistical Package for the Social Sciences Version 25.0.

Results: One hundred and twenty (50) patients (age range – 51 – 83 years) were enrolled in the study. Of the 50 patients who had MRI guided prostate biopsy, 32 patients(76%) had histological diagnosis of prostate cancer with mean age of 65.72 years. The sensitivity, specificity, Positive Predictive Value (PPV), negative predictive value (NPV), accuracy and cancer detection rate of MRI guided prostate biopsy were 86.49%, 98.48%, 88.89%, 98.11%, 97.00% and 64% respectively. Cancer detection rate (CDR) was observed to correlate positively with increasing PIRADS score

Conclusion: Multiparametric magnetic resonance imaging with cognitive targeted prostate biopsy has a high cancer detection rate among patients with suspicious lesions on MRI. There is a positive correlation between PIRADS score and cancer detection rate.

Keywords: Cognitive Targeted Prostate Biopsy; Multiparametric MRI; Prostate Cancer; Prostate Needle Biopsy; Suspicious Lesions

Introduction

Prostate cancer is the second most common cancer in men worldwide and the fifth most common cause of cancer death in men [1]. prostate cancer incidence increases as men age; as many as 60% of men over 65years of age may be diagnosed with prostate cancer [2]. It is commonly diagnosed in men aged 65 – 74 years with the median age at diagnosis being 66 years [3]. Trans Rectal Ultrasound (TRUS)-guided biopsy is performed to confirm diagnosis following abnormal finding(s) from the screening modalities. The risk of over-diagnosis of clinical insignificant cancers remains worrisome and significant. Clinically significant cancer is defined via imaging or histology as a tumour with a volume greater than $0.5cm^3$ or a Gleason score of greater or equals to seven/ 6mm in length respectively [4]. Magnetic Resonance Imaging (MRI) is a tool with growing importance in prostate cancer evaluation; the introduction of Multiparametric MRI (mp-MRI) has seen an increase in accuracy for localisation and detection of Prostate Cancer (Pca) [5-8]. Multiparametric MRI involves the use of specific sequences such as T2W, DWI and DCE. Prostate MRI reporting is getting more structured by implementation and improvement of the Prostate Imaging Reporting And Data System (PI-RADS) [9,10]. MRI-Guided Prostate Biopsy (MRGB) has been shown in various studies to improve the quality of a biopsy after a diagnostic MRI and is now becoming the new gold standard [11,12]. A clinical method for targeted prostate biopsy is the targeted TRUS-guided biopsy of Clinical Suspicious Lesions (CSL) on prostate MRI also known as Cognitive Targeted Biopsy (CTB) or visually- registered targeted biopsy. Many studies have shown promising results for cognitive targetting of clinical suspicious lesions [13,14]. This study aims to evaluate the detection rates of prostate cancer for magnetic resonance imaging-guided prostate biopsy related to Prostate Imaging Reporting and Data System score.

Materials and Methods

The study was prospectively conducted in the urology unit of the Lagos University Teaching Hospital (LUTH) between February 2024 to March 2025. The sample size was estimated to be 43 (at attrition rate of 40%) using Cochran's formula. All male patients who presented for evaluation of their prostatic diseases had DRE and serum PSA assay performed on them. The study protocol was approved by the Lagos University Teaching Hospital Human Research and Ethics Committee (LUTHHREC). Inclusion criteria were the presence of elevated PSA (>4ng/ml) or abnormal prostatic findings on DRE and ultrasonography. Patients with clinical and radiologic features of advanced malignant disease of the prostate were excluded. Fifty patients met the inclusion criteria and gave consent to participate in the study. All the subjects were sent for multiparametric MRI of the prostate (mp-MRI) using a Toshiba Elan Vantage (eS Edition) with a magnetic strength of 1.5T. Suspicious areas and corresponding zones were noted following review of the MRI images. Each patient was worked up for TRUS-guided prostate biopsy using unit protocol of preparation viz; stoppage of anticoagulants and anti-platelets, administration of rectal suppository (bisacodyl 10mg) the night before the procedure and prophylactic intravenous antibiotics (levofloxacin 500mg stat + metronidazole 500mg stat) prior to the procedure. Patients were placed in lateral decubitus position; a preliminary DRE was done by the researcher and findings documented. About 10mls of 2% xylocaine gel was instilled intra-rectally for topical anaesthesia and lubrication 15 minutes before biopsy was commenced. TRUS of prostate was performed with a 7.5MHz trans rectal probe using a digital ultrasound scanner (S22; SonoScape Medical Corp, Guangdong, China). A peri-prostatic nerve block was done using 5ml of 1% lidocaine injection to the apex and both sides of the prostate base. All patients had tissue cores taken from suspicious lesions on pre biopsy multiparametric MRI with the aid of an 18G core biopsy needle mounted on a spring-loaded automated biopsy gun. Patients with negative findings on mp-MRI had systematic biopsies of 18 cores, including sonographic suspicious areas. Relevant information including demographic data, examination findings, indications for biopsy and results of histopathology were obtained using a pro forma. The data were analysed using Statistical Package for the Social Sciences (SPSS) version 25.0. The results are described in statistical indices (sensitivity, specificity, NPV, PPV and accuracy). Receiver Operating Characteristic (ROC) curve and Pearson's correlation coefficient were used with the $P<0.05$ considered as significant.

Results

A total of fifty (50) patients were studied with age range of 51 – 83 years and a mean age of 65.90 ± 7.56 years; most patients (22 i.e. 44%) falling within the 61 – 70 years (Figure 1) bracket while only one patient was aged over 80 years(2%). Mean age of patients with benign prostatic hyperplasia is 66.22 ± 6.916 years while the mean age of patients with adenocarcinoma of the prostate was 65.72 ± 8.005 years

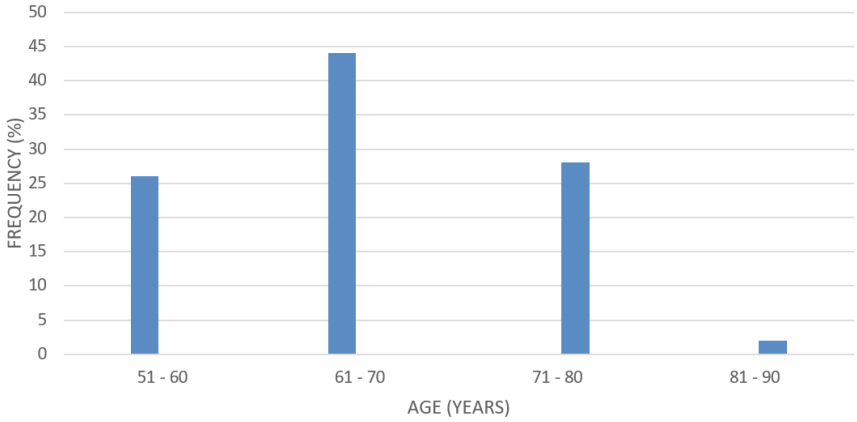

Figure 1: Age Distribution Of Patients Who Had Prostate Biopsy (N=50).

Thirty two of the fifty patients (64%) had prostatic adenocarcinoma while eighteen patients (36%) had benign features on histology of the prostate. The range of the prostate-specific antigen (PSA) was from 0.97 – 20ng/ml. The mean PSA for patients diagnosed with benign prostatic hyperplasia and prostate cancer were 9.8150 ± 4.683ng/ml and 14.2875 ± 4.745ng/ml respectively (Table 1).

See Table 1

	Histology	Frequency Of Histology	Mean Psa	Standard Deviation	T	P Value
Psa	Benign	18	9.815	4.68336	3.214	0.002
	Cap	32	14.2875	4.7451		

Table 1: Mean Psa For Patients With Benign And Malignant Prostate Disease.

Out of the thirty-two (32) patients who had prostate cancer, 19 (59.4%) had Gleason score of 7; making it the highest occurring Gleason score of the group (intermediate grade). Nine patients had Gleason score of 6 while three and one patient had Gleason score of 8 and 9 respectively. No patient had Gleason score of 10 (Table 2).

See Table 2

Gleason Score	Frequency(N)	Percentage (%)
6	9	28.1
7	19	59.4
8	3	9.4
9	1	3.1
Total	32	100

Table 2: Distribution Of Gleason Score Of Patients With Prostate Cancer.

Twenty-two patients with prostate malignancy had prostate imaging reporting and data system score (PIRADS) of 5; only 3 patients with PIRADS 5 lesions on MRI had benign features. None of the patients with PIRADS 1 – 3 lesions on MRI had malignant histology (Table 3).

See Table 3

Pirads	Benign	Malignant
1	1	0
2	10	0
3	2	0
4	2	10
5	3	22

Table 3: Pirads Score Distribution Of Patients.

The mean prostate imaging reporting and data system score (PIRADS) on multiparametric MRI of the prostate of patients who were found histologically to have prostate adenocarcinoma and benign features are 4.63 and 2.83 respectively (Table 4) ; which represents a positive correlation with histological outcome.

See Table 4

Histology	Freq.	Mean	Std Deviation	T	P Value
Benign	18	2.83	1.249	6.662	0
Prostate Cancer	32	4.63	0.66		

Table 4: Mean Pirads Score For Benign And Malignant Prostate Disease.

Multiparametric MRI of the prostate in prostate cancer detection

Ninety six (96) of the 900 prostatic zones had features suggestive of malignancy on MRI (PIRADS 4 & 5) and resulted in a histology of adenocarcinoma (true positive) while 777 prostatic zones had non-malignant feature with benign feature histologically (86.3%), true negative. False negative and false positive accounted for 15 and 12 prostatic zones respectively of the 900 zones (Table 5).

See Table 5

Diagnostic Variables		False Negative	False Positive	True Negative	True Positive	Total
Mpmri	Freq	15	12	777	96	900
	Percent	1.7	1.3	86.3	10.7	100

Table 5: Multiparametric Mri In Prostate Cancer Detection.

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI in prostate adenocarcinoma detection were 86.49%, 98.48%, 88.89%, 98.11% and 97.00 respectively (Table 6)

See Table 6

	Mpmri	95% Ci
Sensitivity	86.49%	78.69% - 92.23%
Specificity	98.48%	97.36% - 99.21%

Positive Likelihood Ratio	56.86	32.28 - 100.18
Negative Likelihood Ratio	0.14	0.09 - 0.22
Disease Prevalence	12.33%	10.26% - 14.66%
Positive Predictive Value	88.89%	81.95% - 93.37%
Negative Predictive Value	98.11%	97.00% - 98.81%
Accuracy	97.00%	95.67% - 98.01%
Auc	0.933	

Table 6: Predictive Value Of Mpmri In Prostate Cancer Detection.

Multiparametric magnetic resonance imaging show a high strength in the ability to correctly determine the absence of prostate cancer. This translates to a high specificity of 98.48% for mMRI. The area under the Receiver Operating Characteristic (ROC) curve for mpMRI was 0.933. The mpMRI curve is close to 1 which signifies a high accuracy

See Table 7

Area Under The Curve					
Test Result Variable(S)	Area	Std. Error[a]	Asymptotic Sig.[B]	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Mri	0.933	0.019	0	0.895	0.97
The Test Result Variable(S): Mri Has At Least One Tie Between The Positive Actual State Group And The Negative Actual State Group. Statistics May Be Biased.					
A. Under The Nonparametric Assumption					
B. Null Hypothesis: True Area = 0.5					

Table 7: Area Under Curve Of Receiver Operating Characteristic For Mpmri Area Under The Curve.

Out of the 32 patients with prostate cancer in this study, 10 had PIRADS 4 lesions while 22 had PIRADS 5 lesions; this gives an overall cancer detection rate for cognitive targeted biopsy to be 64%(32 of 50 patients). Cancer Detection Rate (CDR) was observed to correlate positively with increasing PIRADS score (Table 8). Ten (10) of 12 patients with PIRADS 4 lesions had prostate cancer (CDR of 83.3%) while 22 of 25 patients with PIRADS 5 had prostate cancer (CDR of 88%).

See Table 8

Pirads Score	Benign Histology	Malignant Histology	Total	Cancer Detection Rate (%)
1	1	0	1	0
2	10	0	10	0
3	2	0	2	0
4	2	10	12	83.3
5	3	22	25	88

Table 8: Cancer Detection Rates For Cognitive Targeted Biopsy.

Discussion

Prostate cancer is the second most common cancer in men worldwide.[1] Newer techniques are also being developed to improve detection of clinically significant prostate cancer. The introduction of multiparametric magnetic resonance imaging has seen an increase in accuracy for localisation and detection of prostate cancer [5,6,7,8]. This study revealed the prevalent age for prostate cancer to be 51 – 83 years with a mean age of 65.90 ± 7.56years; this is comparable to various local and international studies. Ajape et al [15] in Ilorin, also found a mean age of presentation of 68.4 ± 10.1. In a community-based study by Ikuerowo et al [16] a lower mean age of presentation at 60.8 years was observed; this may be explained by the earlier diagnosis expected of a screening exercise that identified patients with prostate cancer without bothersome symptoms which would have prompted presentation to the hospital. Rawla et al [2] identified an increasing incidence of prostate cancer as men age; with 60% of men over age 65 years being at risk. Similarly, another study reported a median age of diagnosis of prostate cancer to be 66 years [3]. This age distribution and mean age confirm that age is a known risk factor in prostate cancer pathology. Digital rectal examination for all the patients with prostate cancer in this study revealed benign findings. Ojewola et al [17] however in a study that evaluated the usefulness of digital rectal examination in the diagnosis of prostate cancer in an unscreened population, reported a sensitivity, specificity and accuracy of 75.7%, 44.7% and 58% respectively; this may be due to the wider spectrum of patients seen ranging from early to advanced cases of prostate cancer compared to the predominantly early stage prostate cancer of patients in this study. The prostate specific antigen range of the patients in this study was from 0.97 – 20ng/ml; mean PSA for patients with prostate cancer being 14.2875ng/ml. This is similar to studies by Porpiglia et al [18] and Ahmed et al [19] who carried out a similar study comparing systematic biopsy to MRGB of the prostate; both having a maximum PSA of 15. Up to 60 – 75% of prostate cancer have lower echogenicity on TRUS compared to surrounding tissue [20]; the main role of TRUS is however to provide guidance for prostate biopsy due to its low sensitivity and specificity for diagnosis of prostate cancer as seen by Santos et al [21] in a study on the current role of trans rectal ultrasonography in the early detection of prostate cancer. Multiparametric MRI is a promising diagnostic tool for clinically significant prostate cancer.

MRI-guided biopsies may offer an improvement in avoiding overdiagnosis and subsequent overtreatment of prostate cancer [19]. In this study, overall Cancer Detection Rate (CDR) for cognitive targeted biopsy was 64% (32 patients with malignancy of 50 patients). Tonttila et al [22] found a comparable cancer detection rate for cognitive targeted biopsy at 64%. Studies by Porpiglia et al [18] and Ahmed et al [19] showed that the cancer detection rate improved by the addition of multiparametric MRI guided targeted biopsy to the systematic biopsy. Cancer detection rate for CTB in the study by Porpiglia et al [18] is 46%. Similarly, Ahmed et al [19] study showed CDR with CTB alone as 47.5%. The difference can be attributed to the higher sample size in these studies. PIRADS score has been found to be a useful prognostic tool for prostate cancer stratification. This study found the yield of clinically significant prostate cancer for PIRADS 4 and 5 to be 83.3% and 88%. Thangarasu et al [23] in the prospective study on the efficacy of cognitive targeted transrectal ultrasound prostate biopsy in diagnosing clinically significant prostate cancer reported a lower cancer detection rate for PIRADS 4 and 5 at 52.17% and 70% respectively. Ossess et al [24] however reported 69% for PIRADS 4 and 95% for PIRADS 5 for cancer detection rate on cognitive targeted biopsy for clinically significant prostate cancer; differences may be due to the larger sample size in these studies as compared to this and the use of 3T MRI used as against 1.5T MRI used in this study. An AUC value of 0.5 depicts no discriminatory ability whereas AUC value of 1 connotes perfect predictor [25]. The AUC for multiparametric MRI was 0.933 which revealed that the use of mpMRI for cognitive targeted biopsy very accurate accurate.

Conclusion

Multiparametric magnetic resonance imaging with cognitive targeted prostate biopsy has a high cancer detection rate among patients with suspicious lesions on MRI. There is a positive correlation between PIRADS score and cancer detection rate.

Source of Support: Nil

Conflict of Interest: None Declared

References

1. Mohammed AZ, Edino ST, Ochicha O, Gwarzo AK, Samaila AA (2008) Cancer in Nigeria: a 10 year analysis of the Kano Cancer Registry. Nigerian Journal of Medicine 17: 280-284.
2. Rawla P (2019) Epidemiology of Prostate Cancer. World J Oncol 10: 63-89.
3. Cancer Stat Facts: Prostate Cancer. National Cancer Institute.
4. Chen FK, De Castro Abreu AL, Palmer SL (2016) Utility of Ultrasound in the Diagnosis, Treatment, and Follow-up of Prostate Cancer: State of the Art. Journal of Nuclear Medicine 57: 13S-18S
5. Hoeks CM, Barentz JO, Hambrock T, Yakar D, Somford DM, et al. (2011) Prostate cancer: multiparametric MR imaging for detection, localisation, and staging. Radiology 261: 46-66.
6. Kim CK, Park BK (2008) Update of prostate magnetic resonance imaging at 3T. J Comput Assist Tomogr 32: 163-172.
7. Kim CK (2015) Magnetic resonance imaging-guided prostate bioUpsy: present and future. Korean J Radiol 16: 90-98.

8. Bjurlin MA, Meng X, Le Nobin J, Wysock JS, Lepor H, et al. (2014) Optimisation of prostate biopsy: the role of magnetic resonance imaging targeted biopsy in detection, localisation and rise assessment. J Urol 192: 648-658.

9. Barentsz JO, Richenberg J, Clements R, Choyke P, Verma S, et al. (2012) ESUR prostate MR guidelines 2012. Eur Radiol 22: 746-757

10. Weinreb JC, Barentsz JO, Choyke PL, Cornud F, Haider MA, et al. (2016) PI-RADS prostate imaging-reporting and data system: 2015,Version 2, Eur Urol 69: 16-40.

11. Hambrock T, Hoeks C, Hulsbergen-van de Kaa C, Scheenen T, Futterer J, et al. (2012) Prospective assessment of prostate cancer aggressiveness using 3-T diffusion-weighted magnetic resonance imaging guided biopsies versus a systematic 10-core transrectal ultrasound prostate biopsy cohort. Eur Urol 61: 177-184.

12. Franiel T, Stephan C, Erbersdobler A, Dietz E, Maxeiner A, et al. (2011) Areas suspicious for prostate cancer: MR-guided biopsy in patients with at least one transrectal US-guided biopsy with a negative finding-multipara-metric MR imaging for detection and biopsy planning. Radiology 259: 162-172.

13. Peuch P, Rouviere O, Renard-Penna R, Villers A, Devos P, et al. (2013) Prostate cancer diagnosis: multiparametric MR-targeted biopsy with cognitive and transrectal US-MR fusion guidance versus systematic biopsy-prospective multicentre study. Radiology 268: 461-469.

14. Haffner J, Lemaitre L, Puech P, Haber GP, Leroy X, et al. (2011) Role of magnetic resonance imaging before initial biopsy: comparison of magnetic resonance imaging-targeted and systematic biopsy for significant prostate cancer detection. BJU Int 108: E171-178

15. Ajape AA, Ibrahim OO, Fakeye JA, Abiola OO (2010) An Overview of Cancer of the Prostate, Diagnosis and Management in Nigeria: the Experience in a Nigerian Tertiary Hospital. Annals of African Medicine 9: 113-117.

16. Ikuerowo SO, Omisanjo OA, Bioku MJ, Ajala MO, Nonyelim Mordi VP, et al. (2013) Prevalence and Characteristics of Prostate Cancer among Participants of a Community Based Screening in Nigeria Using Serum Prostate-Specific Antigen and Digital Rectal Examination. Pan African Medical Journal 15: 129-135.

17. Ojewola RW, Tijani KH, Jeje EA, Ogunjimi MA, Anunobi CC, et al. (2013) An evaluation of usefulness of prostate specific antigen and digital rectal examination in the diagnosis of prostate cancer in an unscreened population;experience in a Nigerian Teaching Hospital. West Afr.J.Med 32: 8-13.

18. Porpiglia F, Manfredi M, Mele F, Cossu M, Bollito E, et al. (2017) Diagnostic Pathway with Multiparametric Magnetic Resonance Imaging Versus Standard Pathway; Results from a Randomized Prospective Study in Biopsy-naïve Patients with Suspected Prostate Cancer.Eur Urol 72: 282-288.

19. Ahmed HU, El-Shater Bosaily A, Brown LC (2017) and the PROMIS study group. Diagnostic accuracy of multi-parametric MRI and TRUS biopsy in prostate cancer(PROMIS): a paired validating confirmatory study. Lancet 389: 815-822.

20. Salji MJ, Ahmad I, Slater S, Poon FW, Alhasso A, et al. (2019) Prostate neoplasm. In: Omar M. Aboumarzouk, Editor. Blandy's Urology 3rd Edition. Hoboken: Wiley Blackwell. 2019: 563-598.

21. Santos VCT, Milito MA, Machiori E (2006) Current role of transrectal ultrasonography in the early detection of prostate cancer.Radiol.Bras 39: 185-192.

22. Tonttila PP, Lantto J, Paako E, Piippo U, Kauppila S, et al. (2016) Prebiopsy Multiparametric Magnetic Resonance Imaging for Prostate Cancer Diagnosis in Biopsy-naïve men with Suspected Prostate cancer Based on Elevated Prostate-specific Antigen Values;Results from a Randomized Prospective Blinded Controlled Trial.Eur Urol 69: 419-425.

23. Thangarasu M, Jayaprakash SP, Selvaraj N, Bafna S, Paul R, et al. (2021) A Prospective Study on the Efficacy of Cognitive Targeted Transrectal Ultrasound Prostate Biopsy in Diagnosing Clinically Significant Prostate Cancer.Research and Reports in Urology 13: 207-213.

24. Ossess DF, van Asten JJ, Tijsterman JD (2018) Cognitive-Targeted versus Magnetic Resonance Imaging- Guided Prostate Biopsy in Prostate Cancer Detection.Curr Urol 11: 182-188.

25. Mandrekar N (2010) Receiver Operating Characteristic curve in diagnostic test assessment.J.Thorac.Oncol 5: 1315-1316.