Original Article

Clinicopathologic Profile and Pelvic Magnetic Resonance Imaging Pattern of Prostate Cancer in Southeast Nigeria

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ABSTRACT

Background: Prostate cancer (PCa) is the most frequently diagnosed malignancy in men. It is the commonest cancer in Nigerian men. Multiparametric magnetic resonance imaging (mpMRI) is essential in the evaluation of patients with PCa. **Aim:** To evaluate the clinicopathologic profile and pelvic MRI pattern of prostate cancer patients. **Methods:** This was a retrospective study performed between July 2020 and June 2024. The study population was derived from men with histologically diagnosed PCa who subsequently had mpMRI for cancer staging. From the medical records, age, prebiopsy PSA, Gleason score (GS) and other relevant information were obtained. **Results:** The records of 458 subjects were retrieved. A total number of 229 subjects had their prebiopsy PSA recorded while 158 subjects had their GS recorded. The mean age of the subjects was 66.38 ± 8.46 years, while the mean and median prebiopsy PSA were 49.37 ± 59.81 ng/ml and 33ng/ml, respectively. The mean GS of the subjects was 7.72 ± 1.29. The prostate capsule was the most commonly invaded structure (65.4%). The prevalence of bone metastasis was 22.8%, and the spine was the most commonly affected bone. Stage 3 and stage 4 disease were the most predominantly observed (58.4% and 32%, respectively). There was a statistically significant but weak correlation between tumor stage and GS. **Conclusion:** The subjects' clinicopathologic profile and pelvic MRI findings show that patients commonly present with advanced prostate cancer in our environment.

KEYWORDS: *Gleason score, magnetic resonance imaging, prostate cancer*

INTRODUCTION

Prostate cancer is the most frequently diagnosed malignancy in men[1,2] and is the second most common cause of cancer-related deaths.[1] In Africa, prostate cancer is the leading cancer both in occurrence and number of deaths.[3] It is the commonest cancer in Nigerian men.[4,5] Its clinical spectrum ranges from indolent to highly aggressive types. It is known to be more aggressive in men of African descent who usually present with more advanced disease.[6,7] Owing to high prevalence of the aggressive form of prostate cancer in Black Africans, morbidity is usually pronounced with patients presenting with bone pains, obstructive nephropathy, and hematuria.

Prostate-specific antigen (PSA) level, Gleason score (GS), and magnetic resonant imaging (MRI) findings could give vital information about the degree of aggressiveness of prostate cancer. In clinical practice, the authors observed that markedly elevated PSA was commonly found with aggressive prostate cancer. The GS represents the sum of the most predominant and second most dominant histological patterns of growth. High GS indicates aggressive tumor with high potential for local and distant spread.[8-10] MRI plays an essential role in the diagnosis and staging of prostate cancer.[11-13] Particularly, multiparametric

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magnetic resonance imaging (mpMRI) has emerged as an anatomical and functional method that offers diagnostic accuracy in detecting, localizing, and staging prostate cancer. It is a combination of T2-weighted imaging, diffusion-weighted imaging, and diffusion contrast-enhanced imaging,[14,15] and it is currently the best imaging modality for the diagnosis and staging of prostate cancer.[16] Although mpMRI is essential in the management of patients with prostate cancer (PCa), the needed MRI machine is not available in many tertiary institutions in the West African subregion due to the high cost of acquisition and maintenance. Where available, a lot of patients are usually not able to benefit from it due to financial constraints. Hence, data on pelvic MRI pattern of PCa in our setting are limited in the literature. This creates a knowledge gap in this regard, and this study was structured to bridge this knowledge gap and provide essential data that would serve as reference points for other studies in our subregion and beyond.

Materials and Methods

This was a retrospective study performed over a 4-year period between July 2020 and June 2024. Ethical approval was obtained from the Health Research Ethics Committee of the University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu (approval number: NHR EC/05/01/20D8B-FWA00002458-1RB00002323; date: 15/11/24).

The study population was derived from men with histologically diagnosed PCa following core needle prostate biopsy (either digitally guided or ultrasound guided). They subsequently had mpMRI for cancer staging. The mpMRI was performed in Memfys hospital of Neurosurgery Enugu with a 1.5T, GE Machine, Model Signa Explorer with 16-channel external phased array coil. Noncontrast axial T1W, T2W, sagittal T1W, and coronal fat saturated images of the pelvis were acquired, coupled with a high b-value axial diffusion-weighted image (DWI, b-1400) with calculated Apparent Diffusion Coefficient (i.e., ADC map). Axial 3-D dynamic contrast enhanced T1-weighted imaging with temporal resolution were acquired using 5-mm slice thickness in addition to full-pelvis postcontrast T1-weighted imaging. Memfys Hospital Enugu is a large volume referral center for MRI services with patients drawn from various states of the Southeast region and beyond. The medical records of PCa patients who had mpMRi were retrieved for this study. From the medical records, age, prebiopsy PSA and GS were extracted. In addition, information on tissues invaded by the tumor, areas of metastatic deposits and the tumor stage was obtained. Two radiologists with over 8 years of experience evaluated all the MRI results while a pathologist with over 9 years of experience evaluated the prostate biopsy specimens. Analysis was conducted using SPSS version 22. Data were described using frequencies and proportions in tables and charts.

Results

The records of 458 subjects that had mpMRI in the course of their management for PCa were retrieved for this study. A total number of 229 subjects had their prebiopsy PSA recorded, while 158 subjects had their GS recorded.

The mean age of the subjects was 66.38 ± 8.46 years while the mean and median prebiopsy PSA were 49.37 ± 59.81 ng/ml and 33ng/ml respectively. The GS of the subject ranged from 6 to 10 with a mean

Table 1: Mean, range, and median statistics of the subjects' age; prebiopsy PSA and Gleason scores

	n	Minimum	Maximum	Mean	S.D	Median
Age	458	37	92	66.38	8.46	
Prebiopsy PSA (ng/ml)	229	5	600	49.37	59.81	33.00
Total Gleason Score	158	6	10	7.72	1.29	

Table 2: Distribution on the number of the bones affected

Number of bones affected	Frequency	Percentage
0.00	355	77.2
1.00	50	10.9
2.00	35	7.6
3.00	20	4.3
Total	460	100.0

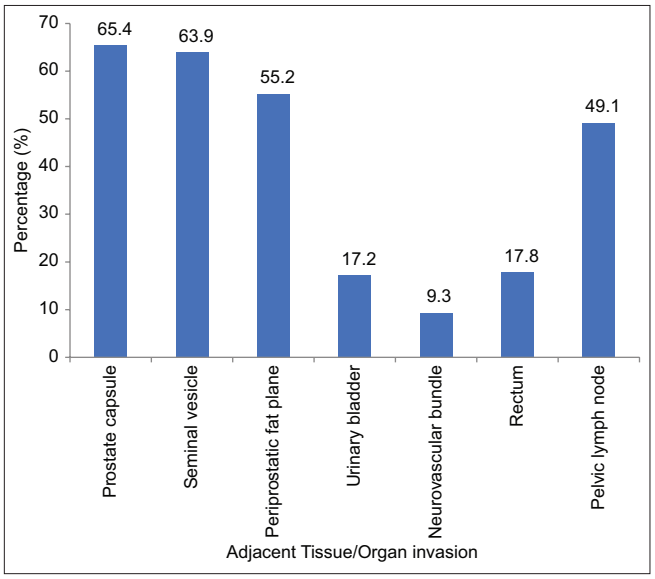

Figure 1: Percentage distribution of the tissues invaded

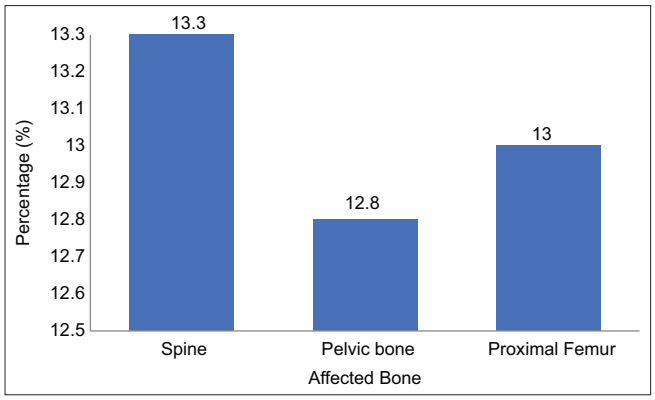

Figure 2: Percentage distribution of the bones affected

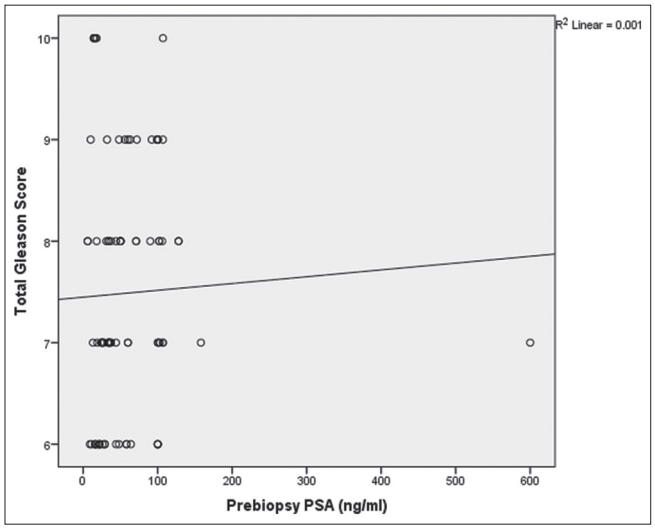

Figure 4: Correlation between Gleason score and prebiopsy PSA

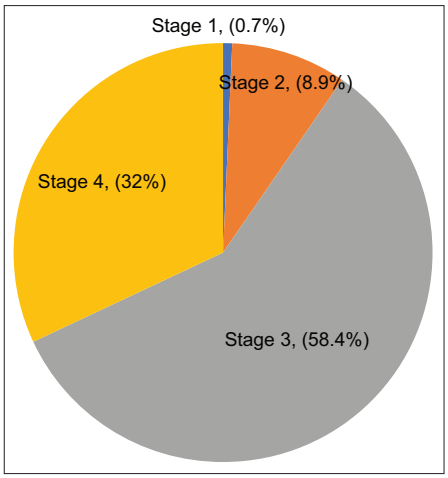

Figure 3: The Percentage distribution of tumor stages

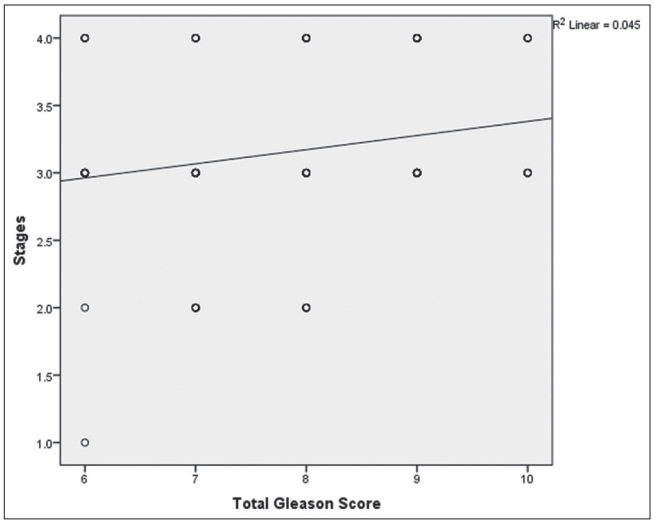

Figure 5: Correlation between tumor stage and Gleason score

value of 7.72 ± 1.29 [Table 1]. Prostate capsule was most commonly invaded structure (65.4%), while the neurovascular bundle was the least invaded structure (9.3%), as illustrated in Figure 1. The prevalence of bone metastasis was 22.8%, and the spine was the most commonly affected bone [Figure 2]. Some of the subjects had metastatic spread to multiple bones [Table 2]. Stage 3 and stage 4 disease were the most predominant among the subjects (58.4% and 32%, respectively), while only 9.6% had stage 1 and stage 2 disease [Figure 3]. There was a very weak statistically insignificant correlation between Gleason score and prebiopsy PSA (r = 0.038, *P* = 0.724) [Figure 4] and a statistically significant but weak correlation between tumuor stage and GS (r = 0.202, *P* = 0.014), as shown in Figure 5 below.

Discussion

Prostate cancer (PCa) is known to be associated with advancing age with more than 85% of cases diagnosed after 65 years.[17] Our finding is consistent with this assertion as evidenced by a mean age 66.38 ± 8.46 years. This mean age is similar to what was reported by some other authors.[18-21] The mean PSA of 49.37 ± 59.81 ng/ml found in this study is quite high suggesting late presentation by many of the subjects. This has always been the observation in developing countries and resource poor settings. Ignorance and financial constraint are the most common implicating factors. Furthermore, some men in these settings may be reluctant to seek medical care because of concerns regarding the side effects of therapy such as sexual dysfunction.[22] Therefore, there is need to improve access to healthcare in developing countries in addition to engaging men in rural and urban settings to educate them appropriately on prostate cancer and its symptoms.

The most common Gleason score noted in this study was 7. This is consistent with what other studies conducted in Nigeria documented.[23-25] Gleason score is strongly related to the clinical behavior of PCa with high

scores like 9 and 10 usually associated with aggressive tumors. Apart from exhibiting high Gleason scores, aggressive PCa would usually invade surrounding structures if treatment is not commenced early. Analysis of the mpMRI of the subjects in this study showed that the most commonly invaded structure was the prostate capsule (65.4%), followed by the seminal vesicle (63.9%), while the neurovascular bundle (9.3%) was the least invaded structure [Figure 1]. Invasion of these surrounding structure would ultimately have an effect on the choice of a curative treatment like radical prostatectomy. The option would then be anchored on androgen deprivation therapy. Adequate knowledge and awareness of prostate cancer among men in developing countries could lead to early detection of these tumors when they are still confined to the prostate making room for a curative treatment and improved survival. The prevalence of bone metastasis was 22.8%, and expectedly, the spine was the most commonly affected bone [Figure 2]. Some of the subjects had metastasis to more than one bone [Table 2]. Although the mpMRI used in this study could only demonstrate metastasis to surrounding bones, bone metastasis from prostate cancer could also be found at distant sites including a rare site like the mandible. A particular case that involved the mandible was initially managed as toothache until patient's condition worsened.[26] Hence, it is essential that middle aged and elderly man that present with any form of bone pain should be screened for PCa. Stage at diagnosis of PCa is a key predictor of survival. Late stages at diagnosis has been found to have the largest impact in explaining the increased prostate cancer mortality in Black men compared with White men.[27] Studies in African population have consistently demonstrated that many men with PCa usually present with advanced disease.[28-30] This is in consonance with the finding in our study with 90.4% of our subjects presenting with stages 3 and 4 diseases [Figure 3]. In our setting, PCa patients have very poor prognosis with high morbidity and mortality rate. This is unlike in developed countries where prognosis and survival are better. The poorer survival in developing countries compared with that found in the western world may be due to the more advanced stage at which diagnosis is made and treatment started.[31] Notably, lack of awareness of PCa and poor screening programs play key role in the late presentation of patients in sub-Saharan Africa.[32] We found a very weak statistically insignificant correlation between GS and prebiopsy PSA (r = 0.038, P = 0.724) as shown in Figure 4. On the contrary, Woo *et al.*[18] noted in their study that GS significantly correlated with PSA level (ρ = 0.345, P = <0.001). This sharp contrast could be due to the difference in the nature of the tissues used in determining the GS in both studies. We used tissues from core needle prostate biopsy, while Woo *et al.* used radical prostatectomy samples. It is known that core needle biopsy could lead to underestimation of GS in approximately 25% of cases compared with GS determined from radical prostatectomy specimen due to sampling error and tumor heterogenicity.[33,34] The correlation between tumor stage and GS in our study was a weak but statistically significant one (r = 0.202, P = 0.014), as shown in Figure 5 below. However, some other authors noted that tumor stage correlates well with GS.[35-37] By extrapolation, we could have found a stronger correlation between these two variables if we had used radical prostatectomy specimens. To avoid overtreatment or undertreatment of prostate cancer patients in our environment, it is advisable that pretreatment risk stratification is done. This is usually based on PSA level, GS and tumor stage.[38] A major limitation to this risk stratification would be poor availability of MRI machines in the subregion. This underscores the urgent need to improve the quality of health care in sub-Saharan Africa in addition to making relevant policies that would improve knowledge of prostate cancer among men aged 40 years and older.

Limitation of the study

This was a retrospective study with some missing data on the subjects' prebiopsy PSA and GS. The missing data on the prebiopsy PSA and GS might have skewed the observed findings.

Furthermore, the GS was determined from core needle prostate biopsy specimens (rather than radical prostatectomy specimens). Small tumor foci could be missed with core needle specimens leading to underestimation of the GS. Finally, this was a single-center study, and as such, the findings may not necessarily be extrapolated to the general population.

Conclusions

The rate at which patients present with advanced prostate cancer in our environment is alarming. There is urgent need to adapt policies in the sub-Saharan Africa to combat this trend. Imaging modality such as pelvic MRI which is essential for early diagnosis should be made available in tertiary institutions in the subregion to ensure that the disease is identified at an early stage when curative therapy is still feasible.

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Conflicts of interest

There are no conflicts of interest.

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