USING PROSTATE-SPECIFIC ANTIGENTO PREDICT GLEASON SCORES IN AFRICAN MEN SEEKING UROLOGICAL SERVICES AT A REFFERAL HOSPITAL IN KISUMU, KENYA

ABSTRACT

Background: As men age increases, they become prone to prostate lesions such as benign prostatic hypertrophy and prostate cancer. Cells of a prostate gland with benign prostate hypertrophy (BPH) or prostate cancer (Pca) secrete prostate specific antigen (PSA) in large amounts above the normal levels of 0-4ng/ml and thus elevated PSA is biological marker for the diagnosisof prostate cancer therefore early diagnosis using PSA facilitates disease detection; the higher the level of PSA the higher the chance to have prostate cancer (Negahdary et al., 2020; Zhang & Sun, 2018). Patients diagnosed with prostate cancer are graded on Gleason scale which is used to assign risk for disease progression. Can we predict the Gleason scores based on PSA level in patients diagnosed with prostate cancer? The main aim was to correlate patient PSA level and corresponding Gleason scores at the time of prostate biopsy at JaramogiOgingaOdinga Teaching and referral Hospital (JOOTRH).

Method: The study was a cross-sectional retrospective study. The study targeted patient prostate histology reports that had PSA at the time of request for biopsy between 2017 and 2022. Majority of histology reports analyzed and reported without PSA level were excluded. This resulted to 80 sample reports.

Results: The study found that 36 (45%) of patients whose prostate specimens were analyzed tested positive for prostate cancer. Of those who tested positive for prostate cancer, majority 24 (66.7%) of patients who presented with PSA levels greater than 50 ng/ml were labelled as Gleason 7/Group 2 or higher. The study sought to establish the association between Gleason scores and PSA levels. There is a statistically significant positive correlation between Gleason scores and PSA levels ($p = 0.004$, $r = 0.474$). Majority 55 (65%) of patients who presented with high PSA levels (>4 ng/ml) were aged between 60 and 79 years old, followed by >80 years at 15 (18.75%) and 50 to 59 years at 10 (10%). The Pearson correlation between age and PSA levels was found to have a statistically significant positive correlation ($r = 0.236$, $p = 0.035$, 95% CI).

Conclusions: Higher PSA level is associated with higher Gleason scores. Age correlates positively with PSA level.

KEY WORDS: Prostate specific antigen, prostate specimens, prostate cancer, Gleason score

INTRODUCTION

BACKGROUND

Prostate gland is regarded to be at risk of old age-related conditions such as benign prostatic hyperplasia (BPH) and carcinoma. Prostate cancer and benign prostate hypertrophy are common problems among aging male population hat necessitate seeking for urological services. Prostate cancer is the second common cancer diagnosis made in men behind skin cancer. Globally, prostate cancer is the fifth leading cause of death and may be asymptomatic at the early stage with an indolent course (Rawla, 2019). Diagnosis of prostate malignancy is made on the underpinning of urinary tract symptoms and elevated PSA levels (>10ng/mL) which then prompts the need for biopsy to confirm the diagnosis through histological characterization.The characteristic of intraductal prostate cancer that affects the prostate ducts and/or acini is often accompanied with extraprostatic extension and seminal vesicle invasion, as well as a high Gleason score, a significant tumor volume, and adverse prognostic markers. Poorer results are associated high Gleason scores which occur with intraductal carcinoma, which are atypical cribriform lesions of the prostate(Divatia& Ro, 2016).The main aim of this study was to correlate patient PSA level and Gleason scores at the time of prostate biopsy at JaramogiOgingaOdinga Teaching and referral Hospital (JOOTRH). Can we predict the Gleason scores based on PSA level in patients diagnosed with prostate cancer?

METHODOLOGY

Study design

The current study wasa descriptive cross sectional retrospective study design that utilized prostate specimen histology reported ina pathology laboratory as reported between 2018 and 2022. The study was a cross-sectional retrospective study. The study targeted patient prostate histology reports that had PSA at the time of request for biopsy between 2017 and 2022. Majority of histology reports analyzed and reported without PSA level were excluded. This resulted to 80 sample reports.

Data collection

The study was conducted between December 2022 and March 2023. The researcher collected the data from hospital pathology laboratory with the help of two research assistants who were laboratory technicians working in the pathology laboratory and conversant with retrieving soft copy data from the storage site. The data from each prostate pathology report was then transferred into each data extraction form for each patient profile: the age, clinical and PSA levels and Gleason scores.

Data analysis

Descriptive and inferential statistics were done with SPSS version 29 for Windows.Pearson correlation was used to correlate the age and prostate specific levels. Pearson correlationstatistics was used to examine the relationship between Gleason's scores and PSA levels. A p value less than 0.05 was considered statistically significant.

RESULTS

The study found that 36 (45%) of patients whose prostate specimens were analyzed tested positive for prostate cancer. Of those who tested positive for prostate cancer, majority 24 (66.7%) of patients who presented with PSA levels greater than 50ng/ml were labelled asGleason 7/Group 2 or higher. The study sought to establish the association between Gleason scores and PSA levels**(Table 1).**

Table 1: Gleason scores, PSA crosstabulation

		PSA (ng/ml)					Total
		0-4	5-10	11-49	50-99	>100	
Gleason Scores	Gleason<6/Group 1	0	2	3	2	1	8
		0.0%	66.7%	60.0%	33.3%	4.8%	22.2%
	Gleason 7/Group 2	1	0	1	1	6	9
		100.0%	0.0%	20.0%	16.7%	28.6%	25.0%
	Gleason 7/Group 3	0	1	1	1	5	8
		0.0%	33.3%	20.0%	16.7%	23.8%	22.2%
	Gleason 8/Group 4	0	0	0	2	4	6
		0.0%	0.0%	0.0%	33.3%	19.0%	16.7%
	Gleason 9or10/Group 5	0	0	0	0	5	5
		0.0%	0.0%	0.0%	0.0%	23.8%	13.9%
Total		1	3	5	6	21	36
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Pearson,s correlation statistics were used to examine the relationship between Gleason's scores and PSA levels. There is a statistically significant positive correlation between

Gleason scores and PSA levels (p = 0.004, r = 0.474)**(Table 2).** Therefore, the null hypothesis was not supported.

Table 2: Pearson PSA and Gleason scores correlation

Correlations			
		PSA (ng/ml)	Gleason Scores
PSA (ng/ml)	Pearson Correlation	1	.474**
	Sig. (2-tailed)		.004
	N	80	36
Gleason Scores	Pearson Correlation	.474**	1
	Sig. (2-tailed)	.004	
	N	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

Majority 55 (65%) of patients who presented with high PSA levels (>4 ng/ml) were aged between 60 and 79 years old, followed by >80 years at 15 (18.75%) and 50 to 59 years at 10 (10%) **(Figure 1).** Age group 40–49 did not have any patients with elevated PSA. The study sought to establish the correlation between age and PSA level. The mean age at which patients presented with elevated PSA was 60–79 years.

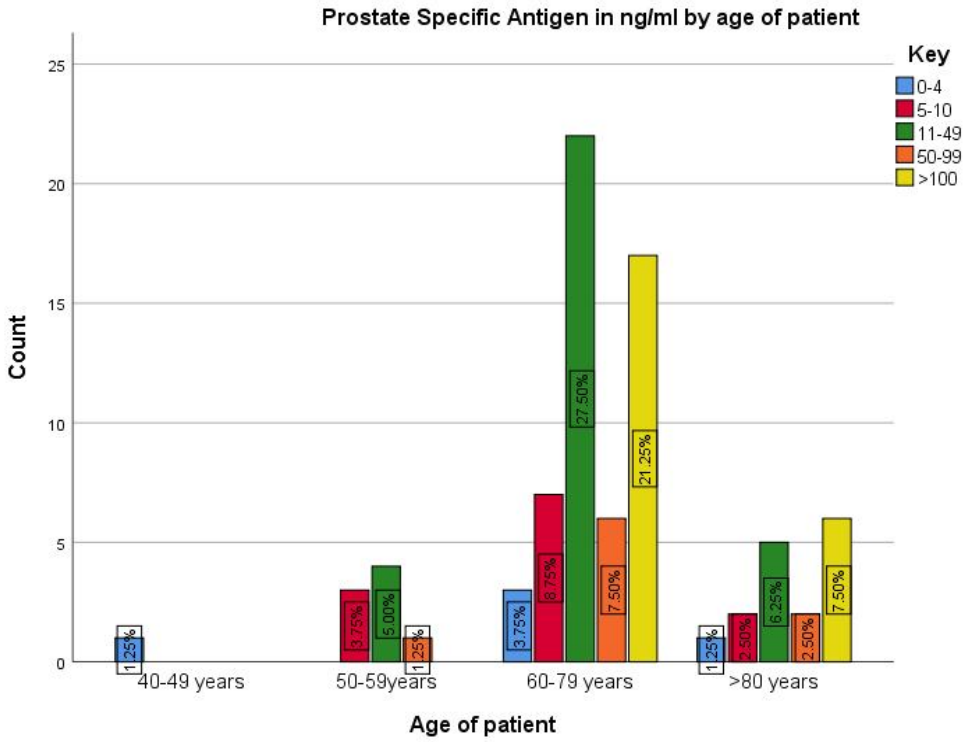

Figure 1: Prostate Specific Antigen levels by age

The Pearson correlation between age and PSA levels was found to have a statistically significant positive correlation (r = 0.236, p = 0.035, 95% CI)**(Table 1).** Hence, H1 was supported. This shows that an increase in age would lead to an increase in PSA levels, and a high PSA level is likely to be observed in men older than 60 who may have higher Gleason scores.

Table 3: Patient Age and PSA Pearson correlation

Correlations			
		PSA (ng/ml)	Age of patient
PSA (ng/ml)	Pearson Correlation	1	.236*
	Sig. (2-tailed)		.035
	N	80	80
Age of patient	Pearson Correlation	.236*	1
	Sig. (2-tailed)	.035	
	N	80	80

*. Correlation is significant at the 0.05 level (2-tailed).

DISCUSSIONS

The current study found a statistically significant association between Gleason scores and PSA levels (p = 0.004, r = 0.474) (Table 2). The current study results agree with Cihan et al.'s (2019) finding that the ISUP grade (based on Gleason scores) of patients was significantly and positively correlated with age and PSA levels. It should be noted, however, that although the findings agree, Cihan et al. (2019) carried out a prospective study, and their reporting would likely have been better compared to a retrospective study. Similarly, (Gündoğdu et al., 2020) found that Gleason scores correlate positively with PSA levels in a prospective study of patients who underwent radical prostatectomy. The current findings, however, are in contradiction with Sanli et al. (2017). This could perhaps be due to the fact that(Sanli et al., 2017) focused on patients who were on treatment follow-up, and therefore the relationship could have been confounded by treatment.

The results of the current study indicate that PSA levels rise with age, and males aged 60 and older were likely to have higher PSA levels ranging from 11 ng/ml to greater than 100 ng/ml. The current study findings agree with Liu et al. (2020; Maciel et al. (2018), whose studies found that the PSA levels start to rise at 58 years, compared to Cihan et al. (2019), who found

that the median age at which PSA levels start increasing is 63 years. The findings in the current study agree with (Cinislioglu et al., 2022; Gilbert et al., 2015) that 30% (compared to the current (36) 45%) of patients with high PSA test positive for cancer of prostate. The age differences in different studies (Cihan et al., 2019; Liu et al., 2020; Maciel et al., 2018)at the time PSA started rising may be an indication that race plays an important role in the PSA levels among males in relation to prostate pathology.

Although the findings of the current study agree with those of (Cihan et al., 2019; Cinislioglu et al., 2022; Gilbert et al., 2015), it is important to note that Cihan et al. (2019) carried out a prospective descriptive study in which a decision to undergo prostate biopsy was made due to complaints of decreased urinary tract symptoms and elevated PSA between July 2019 and December 2019. These findings, however are in contrast with those of(Wang et al., 2019), who found that some of the patients with low PSA levels (0–4 ng/dL) tested positive for prostate cancer. These findings could be interpreted to mean that patients with advanced prostate disease can present with low PSA levels when the function of the prostate is diminished.

The current study findings indicate that 36 (45%) of those who presented with high PSA tested positive for prostate cancer. These findings agree with Zhang and Sun (2018), and perhaps this would suggest that an increase in age would lead to an increase in PSA levels, and a high PSA level is likely to be observed in men older than 60 years who may test positive for prostate cancer on a prostate biopsy. The findings of the current study agree with Maciel et al. (2018) who found that age groups 60–69 and 70–80 show a significant association between free PSA and total PSA ($p = 0.008$). The current study findings are in agreement with other studies(Maciel et al., 2018; Matti et al., 2022; Zhang & Sun, 2018), implying that perhaps PSA is indeed an important variable that changes positively as age advances. Another explanation could be that other studies also employed retrospective cross-sectional studies similar to the current study except for variations in the study population.

Overall, the study findings suggest that age and PSA have a positive correlation ($r = 0.283$) and higher PSA levels are likely to be observed in males aged 60 years and older who may have prostate cancer or benign prostate hyperplasia in order of occurrence. The current study findings, alongside other research findings(Cinislioglu et al., 2022; Kim et al., 2021; Matti et al., 2022; Negahdary et al., 2020; Zhang & Sun, 2018), point to the potential value of routine prostate evaluation in males older than 60 years who present with urinary symptoms so as to

detect prostate lesions early enough. It should be kept in mind that the current study was a retrospective study that reviewed only prostate reports as opposed to prospective studies such as those by(Cinislioglu et al., 2022). Further research is therefore needed to determine the extent of prostate lesions in patients who present with an elevated PSA level.

CONCLUSIONS

Higher PSA level are associated with higher Gleason scores ($p = 0.004$, $r = 0.474$).Higher PSA levels are likely to be observed in males aged 60 years and older who may have prostate cancer or benign prostate hyperplasia in order of occurrence. The research also points to the potential value of routine prostate evaluation in males aged 50-59 years who present with urinary symptoms so as to detect prostate lesions early enough. It should be kept in mind that this study was a retrospective study that reviewed only prostate reports. Further research is therefore needed to determine the extent of prostate lesions (stage) in patients with prostate cancer who present with an elevated PSA level.

Ethical approval & Consent

This study was licensed by national commission for science, innovation and technology vide license number NACOSTI/P/23/22845. Maseno University Board of post graduate approved this study vide approval letter reference number: MSC/SM/00009/020. This study was approved by ethics committee at JaramogiOgingaOdinga Teaching and referral hospital ethics committee videreference numberISERC/JOOTRH/659/22. Consent to collect access data was obtained from hospital chief executive officer before prostate histology reports were retrieved from January 2017 to December 2022. All records were anonymized before print out and therefore no patient identifiers were collected during and after the study.

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