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RELATION OF SERUM PROSTATE SPECIFIC ANTIGEN WITH PROSTATE VOLUME IN BENIGN PROSTATIC HYPERPLASIA PATIENTS"

GENERAL SURGERY

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ABSTRACT

Background:

Benign prostatic hyperplasia (BPH) is a pervasive condition among older men portrayed by prostate organ expansion, frequently connected with urinary side effects. Prostate-specific antigen (PSA) is a key biomarker utilized in Carcinoma prostate finding and observing. Understanding its relationship with volume of prostate might be significant for powerful administration of benign prostatic hyperplasia.

Objectives:

1. To evaluate if patients with benign prostatic hyperplasia may predict their prostate volume using serum prostate specific antigen.

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Materials and Methods:

This prospective cohort study enrolled 110 male patients diagnosed with BPH, assessing relationships between serum PSA levels and clinical parameters such as age and prostate volume. Information were gathered from short term and careful ward settings more than year and a half (July 2022 to January 2024). Factual investigation included expressive measurements, ANOVA, Pearson's connection coefficient, and Spearman's position relationship coefficient

Results:

Significant associations were found between PSA levels and prostate volume ($r=0.531$, $p<0.001$) and severity of BPH ($p<0.001$). PSA levels increased with higher prostate volumes. Patients with more severe BPH grades exhibited elevated PSA levels and larger prostate volumes.

Conclusion:

This study shows that serum PSA levels increase proportionately with prostate volume. Hence serum PSA is a good predictor of prostate volume in BPH patients.

Keywords: Benign prostatic hyperplasia (BPH), prostate-specific antigen (PSA), prostate volume (PV).

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INTRODUCTION

Prostate is a fibromuscular exocrine gland. Ejaculation involves the secretion of a complex proteolytic solution into the urethra by this male auxiliary reproductive gland. The walnut-shaped organ known as the prostate sits beneath the bladder of a human. At the age of 20, an adult male's prostate weighs about 20 grams.

PSA levels

In clinical practice, PSA levels are commonly utilized as a biomarker for a number

of prostate disorders, most notably prostate cancer and benign prostatic hyperplasia

(BPH).

Expanded PSA levels might be an indication of numerous potential issues with the prostate. A pervasive explanation is benign prostatic hyperplasia, a benign state of the prostate. The primary functions of PSA, a protein generated by both normal and aberrant prostate cells, are to liquefy semen and increase sperm motility[1]. While small levels of PSA can enter the bloodstream, the prostate gland is the primary location for PSA in healthy persons. Because elevated PSA levels in blood tests are linked to underlying prostate problems, they frequently urge additional research[2].

It is important to use caution when interpreting PSA results because elevated levels do not necessarily indicate the existence of cancer; rather, they suggest the need for further testing.

PROSTATE VOLUME

Prostate volume is the measure of the size of prostate which is usually estimated by radiological tests such as Trans Rectal Ultrasonography and T2 gated MRI[3]. Normal prostate volume in males is less than 20cc. Increased prostate volume implies prostatomegaly. Hence, the volume

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of prostate increases proportionately with the severity of BPH. Prostate volume measurement accuracy is crucial for clinical assessment and therapy planning.

It is advisable to men who are aged 40 years or above to undergo regular screening to know the status of the prostate[4]. This can be aided by estimating the levels of serum PSA regularly or prostate volumes through a transrectal ultrasound to know the present condition of the prostate or progression of an existing prostate disease. This also helps in planning the further management of the disease in accordance with the symptoms.

AIM

In order to figure out how much prostate tissue is present in benign prostatic hyperplasia patients by using serum prostate specific antigen.

OBJECTIVE OF THE STUDY

1. To evaluate the capacity of serum prostate specific antigen to anticipate the prostate volume in patients with benign prostatic hyperplasia.

MATERIALS AND METHODS

STUDY DESIGN

For this review, we utilized an imminent partner approach. Serum PSA level was assessed in the Organic chemistry branch of Sri Siddhartha Clinical School and Prostate Volume was assessed by transrectal ultrasonography in the Division of Radiology, Sri Siddhartha Clinical School.

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STUDY SETTING

Study was directed on patients going to SSMC OPD with grievances of lower urinary lot side effects, side effects of benign prostatic hyperplasia and the patients conceded in the ward for similar objections.

SOURCE OF DATA:

1. Arrivals to the outpatient department by patients with symptoms involving the lower urinary tract.

2. Patients admitted to surgical ward for the management of BPH.

DURATION OF THE STUDY

Data collection and analysis were done during the course of the research, which was conducted from July 2022 to January 2024, a period of 18 months.

SAMPLE SIZE

In this study of 110 participants, we looked at the correlations between PSA levels in the blood and clinical characteristics in men with benign prostatic hyperplasia (BPH).

The following formula was used to determine this sample size:

$$N = \left[\frac{(Z_{\alpha/2}+Z_{\beta})^2}{C^2}\right] + 3$$

where C is the log odds of the correlation coefficient r, derived from:

$$C = \ln\left(\frac{1+r}{1-r}\right)$$

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110 patients made up the sample size, based on a modest effect size of r=0.3, a significance threshold of α of 0.05, and a power of $1-\beta$ of 0.80. The study's conclusions are strong because of the sample size, which guarantees enough statistical power to identify significant associations between PSA levels and clinical indicators in the setting of BPH.

Inclusion Criteria:

- Patients who come with symptoms related to the lower urinary tract and are older than 40
- Patients identified as having benign prostatic hyperplasia

Exclusion Criteria:

- Patients taking any medication that alters serum PSA levels (such as retinoids) or who have a history of diabetes, TB, hypertension, or urinary tract infections.
- Patients who have previously used 5alpha-5 reductase inhibitors.
- Patients who have gone through obtrusive surgeries for BPH previously, like laser prostatectomy or transurethral resection of the prostate.
- Patients with intense prostatitis or prostate disease conclusion.

STATISTICAL ANALYSIS

In the review, all quantitative boundaries are accounted for utilizing distinct measurements including mean qualities and standard deviations, gave in plain structure to lucidity. The relationship between blood prostate-specific antigen (PSA) levels and prostate volume is analyzed utilizing Pearson's connection coefficient, which evaluates the strength and course of their direct relationship. An importance limit (alpha) of 0.05 was set to lay out measurable importance. Results with p-values bigger than 0.05 were respected measurably non-critical, showing no significant connection between the factors under request.

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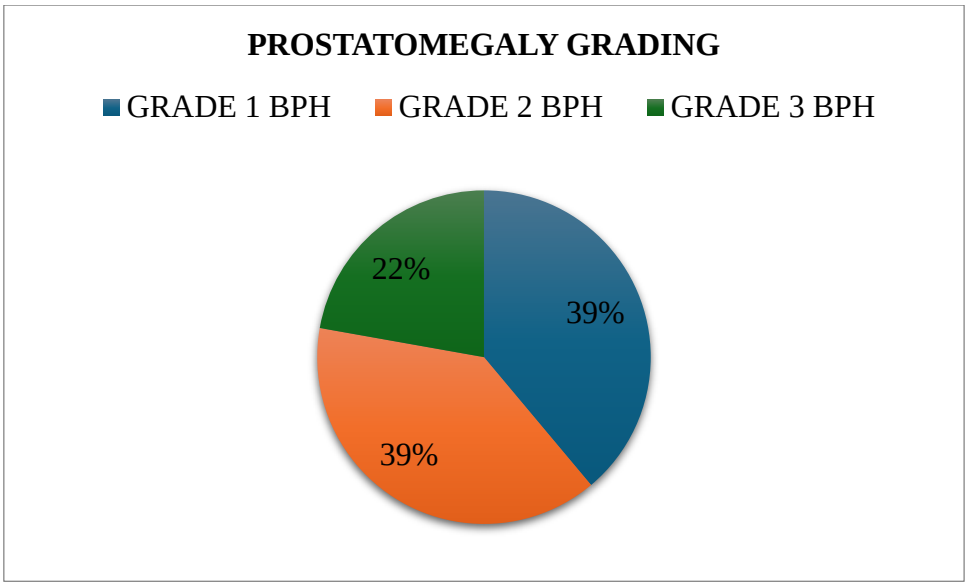
OBSERVATION AND RESULTS

Table 1 : Prostatomegaly Grading (Per rectal Examination)

PROSTATOMEGALY GRADING	Frequency	Percent
GRADE 1 BPH	43	38.9
GRADE 2 BPH	41	38.9
GRADE 3 BPH	26	22.2
Total	**110**	**100.0**



Graph 1: Prostatomegaly Grading (Pre-Examination)

110 research participants' per rectal examination prostatomegaly scores showed a very uniform distribution throughout the various degrees of benign prostatic hyperplasia (BPH). For each grade, 43 individuals were observed in Grade 1 and 43 participants were observed in Grade 2 BPH, accounting for 38.9% of the total sample for each grade. Only 24 individuals (or 22.2% of the total participants) had grade 3 BPH, which is less prevalent. According to this

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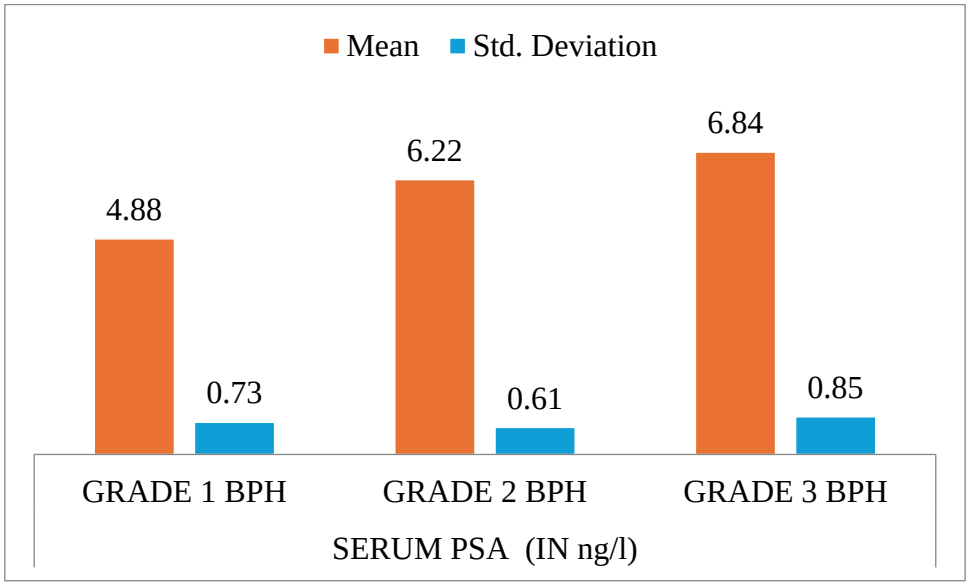
distribution, the majority of research participants had mild to moderate prostate enlargement, with severe enlargement occurring less frequently.

Table 2: Comparison of Parameters with Diagnosis

Variable	Category	N	Mean	Std. Deviation	F	P-value*
SERUM PSA (IN ng/l)	GRADE 1 BPH	43	4.88	0.73	45.202	<0.001
	GRADE 2 BPH	41	6.22	0.61		
	GRADE 3 BPH	26	6.84	0.85		
PROSTATE VOLUME (in ml)	GRADE 1 BPH	43	26.64	1.23	22.801	<0.001
	GRADE 2 BPH	41	29.66	2.56		
	GRADE 3 BPH	26	32.36	4.56		

** Analysis of Variance (ANOVA), Significant if P<0.06*



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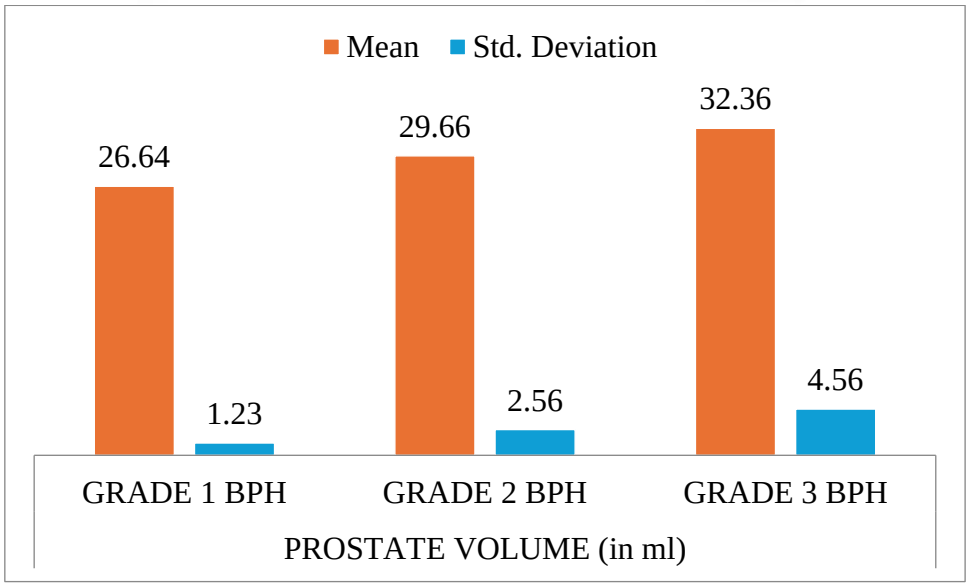

Graph 2: Comparison of Parameters with Diagnosis

The table thinks about serum Prostate-Specific Antigen (PSA) levels, and prostate volume across various grades of Benign Prostatic Hyperplasia (BPH). The review included 110 members arranged into Grade 1, Grade 2, and Grade 3 BPH.

For serum PSA levels, the mean values also increased with the severity of BPH, from 4.88 ng/l in Grade 1, to 6.22 ng/l in Grade 2, and 6.84 ng/l in Grade 3 BPH. This increase was highly significant ($F=45.202$, $p<0.001$), suggesting that higher PSA levels are associated with more severe BPH grades.

In terms of prostate volume, the mean volume increased with the severity of BPH, from 26.64 ml in Grade 1, to 29.66 ml in Grade 2, and 32.36 ml in Grade 3 BPH. This increase was also statistically significant ($F=22.801$, $p<0.001$), indicating that larger prostate volumes are associated with more severe grades of BPH.

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Table 3 shows the connection of Serum Prostate-Specific Antigen (PSA) with Prostate Volume. The investigation was finished utilizing Spearman's position relationship coefficient.

Table 3: Correlation of Serum PSA with Age and Prostate Volume

Parameters	Correlation	P-value*
PROSTATE VOLUME (in ml)	0.531	0.000

** Spearman's rank correlation coefficient, Significant if P<0.06*

The results indicate a strong positive correlation between Serum PSA and ProstateVolume (r=0.531, p=0.000). This suggests that as Prostate Volume increase, Serum PSA levels also tend to increase.

DISCUSSION

In people determined to have benign prostatic hyperplasia (BPH), the connection between Prostate volume and PSA levels was demonstrated to be great. The relationship among PSA and prostate volume proposes that bigger prostates might yield higher PSA levels, which is an impression of the broadened glandular tissue that is available in benign prostatic hyperplasia (BPH) [1].

PSA levels can be utilized as a biomarker in order to track the evolution of the illness and the response to therapy in individuals who have BPH. It is possible for physicians to evaluate the efficacy of therapies and make educated decisions on patient care with the assistance of regular monitoring of PSA levels of the patient[2]. In the second place, the fact that PSA levels are correlated with prostate volume implies that PSA levels might be beneficial in predicting the severity of benign prostatic hyperplasia (BPH). It is possible that patients with higher PSA values have larger prostates and more severe symptoms, which necessitates more aggressive

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treatment options. It was shown that there was a statistically significant association ($r = 0.531$, $p < 0.001$) between prostate volume and blood PSA levels. The strength of the link between these variables is confirmed by the p-value, which shows that there is less than 0.1% probability of seeing such a significant correlation. Research employing correlation analysis, namely the Spearman's rank correlation coefficient, has demonstrated a positive relationship between blood PSA levels and prostate volume. Positive connection shows that blood levels of PSA tend to rise in tandem with an increase in the prostate gland's volume. This association is especially significant in clinical settings when PSA testing is used to screen for suspected prostate illnesses and monitor prostate health.

While some exploration has analyzed the connection between serum PSA and PV in BPH patients, the connection between serum PSA and PV has gotten less consideration. As indicated by Choi et al [5], there was a genuinely huge relationship among's PV and both serum PSA and serum PSA.

In this specific review, the mean PSA esteem was 4.21 ng/mL. When contrasted with the typical PSA range, it was raised than ordinary qualities. This suggests that the serum PSA levels will more often than not be raised in patients with BPH. This is in correspondence with similar studies in the past.

This study implies that prostate volume is significantly correlated with serum PSA levels ($p=0.001$).

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CONCLUSION

The objective of the study was to determine the association of PSA and prostate volume in patients with BPH.Serum PSA increases proportionately with an increase in prostate volume in patients with BPH. This has shown to be statistically significant in this study. It can be concluded that serum PSA levels is a good predictor of prostate volume in patients with BPH.

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