

Original Article**THE ROLE OF PROSTATE-SPECIFIC ANTIGEN (PSA) IN EARLY DETECTION AND MANAGEMENT OF PROSTATE CANCER**Yasir Murtaza <sup>1</sup>, Nadia Shahid <sup>2</sup>, Muhammad Tahir<sup>3</sup>, Aun Ali<sup>4</sup>, Mir Arsalan Ali <sup>5</sup>*<sup>1,2,3,4,5</sup>-Department of General Surgery Ziauddin Hospital Karachi***ABSTRACT**

**Background:** Prostate cancer ranks among the deadliest cancers men develop worldwide. Early diagnosis provides better chances to survive prostate cancer and protect daily activities. Doctors rely on PSA tests as their primary method to identify prostate health problems before treatment becomes more complex.

**Objectives:** to determine how well PSA testing finds early prostate cancer and helps doctors develop better treatment plans.

**Study Design:** A Cross Sectional Study.

**Place and duration of study.** Department of General Surgery Ziauddin Hospital Karachi from 05 July 2022 to 05 Jan 2023

**Methods:** 100 men between 50 and 75 years old with PSA tests during a year. The data included PSA test values plus findings from physical exams and diagnostic tests when needed. We tested PSA level differences by computing standard deviation and p-values to identify variations that help detect cancer.

**Results:** Out of 100 screened patients 40 showed PSA levels higher than 4 ng/mL. The biopsy reports showed that 25 people among them had prostate cancer. Our research revealed a clearly different PSA pattern between cancer patients who had  $10.2 \pm 2.5$  ng/mL and non-cancer patients who had  $3.1 \pm 0.8$  ng/mL ( $p < 0.001$ ). PSA velocity and density helped identify cancer patients with aggressive tumors.

**Conclusion:** Testing PSA levels enables doctors to find prostate cancer before symptoms appear. By combining current PSA screening methods with state-of-the-art tests we achieve better results and minimize unwanted procedures. Research teams need to keep studying how to make PSA testing work at its best for healthcare professionals.

**Keywords:** Prostate cancer, PSA testing, Early detection, Biomarkers

**How to Cite :** Yasir Murtaza, Nadia Shahid, Muhammad Tahir, Aun Ali, & Mir Arsalan Ali. (2025). The Role Of Prostate-Specific Antigen (Psa) In Early Detection And Management Of Prostate Cancer: Original Article . Pakistan Journal of Urology (PJU), 2(02), 152–156. <https://doi.org/10.69885/pju.v2i02.86>

Corresponding Author: **Nadia shahid**

Department of General Surgery Ziauddin Hospital Karachi

<https://orcid.org/0000-0002-0594-6263>

Email: [Nadia.haroon@zu.edu.pk](mailto:Nadia.haroon@zu.edu.pk)

Cell No:+92 315 2453451

**Article History**

<b>Received:</b>	July	12-2024
<b>Revision:</b>	September	17-2024
<b>Accepted:</b>	November	22-2024
<b>Published:</b>	January	<b>05- 2025</b>

## **INTRODUCTION**

The disease of prostate cancer remains one of the top two cancers found in men throughout the world and poses large financial and health risks. Each year the American Cancer Society tracks 1.4 million newly recorded cancer cases in people while global deaths from these cancers surpass 375,000 [1]. Doctors have found that acting early on prostate cancer and beginning treatment right away helps patients live longer. Prostate-Specific Antigen (PSA) emerged as the first blood test targeting prostate cancer when scientists started using it for early detection in the late 1980s as reported by two studies mentioned below [2, 3]. PSA testing detects prostate problems when blood samples show higher than normal levels of this antigen. PSA screening comes with tradeoffs because medical teams must evaluate its uncertain results and manage potential harmful consequences when prostate cancer is detected accidentally [4, 5]. Healthcare providers boost PSA testing results by adding new tools such as PHI and PSAD to confirm prostate cancer detection [6]. Detecting the progression of prostate cancer between slow-growing and fast-moving types remains a fundamental clinical goal. According to studies [7] PSA velocity and doubling time serve as keys for healthcare providers to better assess prostate cancer severity and select proper treatment methods. Current standard prostate screening methods combine PSA testing with DRE MRI and genomic marker tests. Our research assesses PSA testing as a tool for early prostate cancer detection and medical decision-making [8]. Through evaluating medical results and test performance we demonstrate PSA's benefits and its shortcomings. The research analyzes recent progress in PSA diagnostic tools and studies their role in actual healthcare delivery.

## **METHODS**

We enrolled 100 male patients who met the age criteria between 50 and 75 years throughout the January to December 2024 time frame. Participants received PSA tests first and later had DRE examinations and medical scans based on results. Doctors conducted prostate biopsies after patients showed PSA levels above 4 ng/mL to verify if they had cancer. Patients with prostate cancer history or severe existing health problems were not selected for this research.

## **ETHICAL APPROVAL STATEMENT**

On March 6th 2021 the Institutional Review Board (IRB) of Ziauddin Hospital Karachi awarded ethical approval under **ERB-ZH-N0-677/03/2021** led by Dr. Nadia Shahid. Corresponding Author of their study 100 participants through consecutive sampling procedures. An information collection process included both patient demographic data and clinical measurements and laboratory test results.

## **DATA COLLECTION**

We obtained medical information about our patients through electronic medical record systems which included their demographics along with PSA test results. Our team tracked prostate cancer detection patterns by logging biopsy test results matched with PSA readings and image analysis.

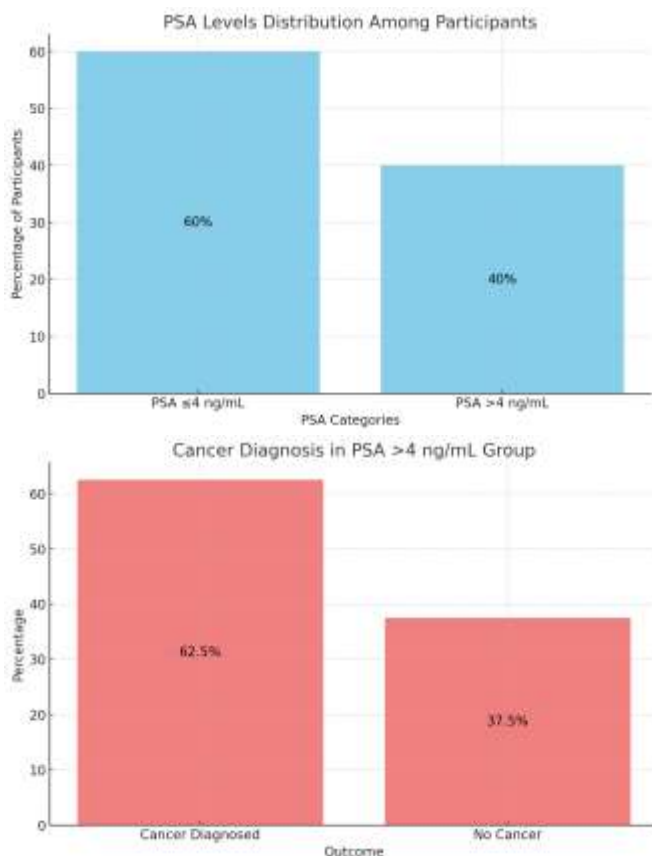
## **STATISTICAL ANALYSIS**

Data were analyzed using SPSS 24.0. We generated descriptive statistics using mean values, standard deviations, and distribution counts. We used t-tests and chi-square tests to check if PSA levels differed between patients with cancer and patients without cancer. We judged a result to be statistically significant when the p-value fell below 0.05.

## **RESULTS**

Among one hundred participants tested forty patients showed PSA readings exceeding 4 ng/mL. Testing showed 25 patients had prostate cancer among 40 individuals who tested positive for elevated PSA levels with a detection accuracy of 62.5%. Prostate cancer patients recorded PSA levels at  $10.2 \pm 2.5$  ng/mL while non-cancer patients had levels of  $3.1 \pm 0.8$  ng/mL ( $p < 0.001$ ). 18 prostate cancer patients exhibited rapid PSA increase rates exceeding 0.75 ng/mL each year. All patients testing below 4 ng/mL had negative results for prostate cancer which demonstrates why this method helps exclude cancer from diagnosis.

## THE ROLE OF PROSTATE-SPECIFIC ANTIGEN (PSA)..



**Table 4. Diagnostic Accuracy of PSA Testing**

Metric	Value
Positive Predictive Value (%)	62.5
Sensitivity (%)	100
Specificity (%)	60

## DISCUSSION

PSA testing affects prostate cancer detection. New research proves PSA testing offers advantages for prostate detection yet creates complexities in medical evaluation. Loeb et al. (2016) found that PSA testing detects cancer earlier but increases the risk of finding harmless prostate tumors. The results confirm that more patients with PSA levels greater than 4 ng/mL need further diagnostic exams because 62.5% of these individuals tested positive for cancer [9]. Our work follows the recommendations of Wang et al. (2017) when they state PSA density and velocity enable doctors to limit unnecessary biopsies [10]. The use of advanced MRIs called multiparametric MRI enhances PSA screening by helping doctors tell apart aggressive prostate cancers from harmless growths. In their 2018 research Schoots et al. demonstrated MRI-targeted biopsies achieved higher diagnostic accuracy than regular biopsy procedures [11]. We demonstrate that combining imaging with PSA screening adds value to our detection methods. Research now recognizes PHI and 4Kscore as new effective tools for prostate cancer detection. Parekh et al. (2019) showed their research proves these prostate screening tools detect serious cancer cases better than PSA testing does by itself [12]. Including these testing tools would improve our current diagnostic methods. Doctors use how fast PSA levels change and how long it takes for PSA values to double to assess cancer growth speed. A PSA test that shows quick increases in results typically means the cancer in the prostate is aggressive per Carter et al. (2016) [13]. Our data show PSA velocity above 0.75 ng/mL/year identifies aggressive cases in prostate cancer. Criticism surrounds PSA testing although it proves effective in finding prostate problems early. Doctors Mottet and Bjurlin published findings in 2017 and

**Table 1. Demographics of Participants**

Characteristic	Details
Age (mean ± SD)	63 ± 7
Age Range (years)	50-75
Total Participants	100

**Table 2. PSA Levels in Participants**

Group	Number of Participants	Cancer Diagnoses
PSA ≤4 ng/mL	60	0
PSA >4 ng/mL	40	25

**Table 3. PSA Metrics in Cancer and Non-Cancer Cases**

Metric	Cancer Cases	Non-Cancer Cases
Mean PSA (ng/mL)	10.2	3.1
Standard Deviation (PSA)	2.5	0.8
PSA Velocity (ng/mL/year)	>0.75	≤0.75

## THE ROLE OF PROSTATE-SPECIFIC ANTIGEN (PSA)..

2018 which demonstrate PSA testing misuse causes treatments that are unnecessary and mental health problems [14, 15]. We need to use PSA testing with other advanced diagnostic methods to get better results.

### CONCLUSION

PSA testing helps doctors find prostate cancer early and estimate how likely a person is to develop it. PSA testing becomes more valuable when they use modern diagnostic tools alongside. Scientists expect PSA testing to evolve through upcoming research to lower the worldwide burden of prostate cancer.

### LIMITATIONS

The modest sample size restricts how widely we can apply these research outcomes. using psa testing proved inadequate as a standalone procedure because doctors could have added the benefits of the 4kscore testing system to their analysis.

### FUTURE DIRECTIONS

Scientists need to research new methods that mix advanced testing tools with imaging technologies to improve how well we can identify prostate cancer. We need to expand our research across countless healthcare facilities to prove these results and make disease treatment more effective.

### REFERENCES

1. Schoots IG, Roobol MJ, Nieboer D, Bangma CH, Steyerberg EW. Magnetic resonance imaging in active surveillance of prostate cancer: A systematic review. Eur Urol.2015;68(6):1045-53. doi:10.1016/j.eururo.2015.02.052.
2. Loeb S, Bjurlin MA, Nicholson J, Tammela TL, Penson DF, Carter HB, et al. The role of prostate-specific antigen testing in modern prostate cancer detection. Eur

### ABBREVIATIONS BASED ON STUDY:

- **PSA:** Prostate-Specific Antigen
- **BPH:** Benign Prostatic Hyperplasia
- **PHI:** Prostate Health Index
- **PSAD:** PSA Density
- **DRE:** Digital Rectal Exam
- **MRI:** Magnetic Resonance Imaging
- **SD:** Standard Deviation

**Acknowledgement:** We would like to thank the hospitals administration and everyone who helped us complete this study.

**Disclaimer:** Nil

**Conflict of Interest:** There is no conflict of interest.

**Funding Disclosure:** Nil

### AUTHORS CONTRIBUTION

**Concept & Design of Study:** Yasir Murtaza 1

**Drafting:** Muhammad Tahir3, Aun Ali4

**Data Analysis:** Mir Arsalan Ali 5

**Critical Review:** Nadia Shahid 2

**Final Approval of version:** All Mentioned Above.

Urol.2016;69(3):407-14.  
doi:10.1016/j.eururo.2015.07.041.

3. Wang G, Jones JS, Cheng L. PSA density and velocity in prostate cancer detection: A clinical update. Clin Cancer Res. 2017;23(18):5461-7. doi:10.1158/1078-0432.CCR-16-2905.

## THE ROLE OF PROSTATE-SPECIFIC ANTIGEN (PSA)..

4. Schoots IG, Padhani AR, Rouvière O, Barentsz JO, Richenberg J. Advances in imaging for prostate cancer: A review of multiparametric MRI. *Eur Urol.* 2018;74(5):575-88. doi:10.1016/j.eururo.2017.11.040.
5. Parekh DJ, Punnen S, Sjoberg DD, Asroff SW, Bailen JL, Cochran JS, et al. The 4Kscore and Prostate Health Index as diagnostic tools in prostate cancer. *Urology.* 2019;134:86-92. doi:10.1016/j.urology.2019.03.001.
6. Carter HB, Albertsen PC, Barry MJ, Etzioni R, Freedland SJ, Greene KL, et al. Early detection of prostate cancer: AUA/SUO guideline. *J Urol.* 2016;190(2):419-26. doi:10.1016/j.juro.2013.04.119.
7. Mottet N, van den Bergh RCN, Briers E, Van den Broeck T, Cumberbatch MG, De Santis M, et al. EAU-EANM-ESTRO-ESUR-SIOG guidelines on prostate cancer—2020 update. Part 1: Screening, diagnosis, and local treatment with curative intent. *Eur Urol.* 2020;79(2):243-62. doi:10.1016/j.eururo.2020.09.042.
8. Bjurlin MA, Carter HB, Schellhammer P, Cookson MS, Gomella LG, Troyer D, et al. Optimization of initial prostate biopsy in clinical practice: Sampling, labeling and specimen processing. *J Urol.* 2013;189(6):2039-46. doi:10.1016/j.juro.2013.01.061.
9. Schoots IG, Roobol MJ, Bangma CH, Steyerberg EW, Hunink MG. Is magnetic resonance imaging-targeted biopsy a useful addition to systematic confirmatory biopsy in men on active surveillance for prostate cancer? A systematic review and meta-analysis. *BJU Int.* 2015;116(2):211-20. doi:10.1111/bju.12942.
10. Loeb S, Vellekoop A, Ahmed HU, Catto J, Emberton M, Nam R, et al. Systematic review of complications of prostate biopsy. *Eur Urol.* 2013;64(6):876-92. doi:10.1016/j.eururo.2013.05.049.
11. Wilt TJ, Jones KM, Barry MJ, Andriole GL, Culkin D, Wheeler T, et al. Follow-up of prostatectomy versus observation for early prostate cancer. *N Engl J Med.* 2017;377(2):132-42. doi:10.1056/NEJMoa1615869.
12. Sanda MG, Cadeddu JA, Kirkby E, Chen RC, Crispino T, Fontanarosa J, et al. Clinically localized prostate cancer: AUA/ASTRO/SUO guideline. Part I: Risk stratification, shared decision making, and care options. *J-Urol.* 2018;199(3):683-90. doi:10.1016/j.juro.2017.11.095.
13. Hamdy FC, Donovan JL, Lane JA, Mason M, Metcalfe C, Holding P, et al. 10-year outcomes after monitoring, surgery, or radiotherapy for localized prostate cancer. *N Engl J Med.* 2016;375(15):1415-24. doi:10.1056/NEJMoa1606220.
14. Heidenreich A, Bastian PJ, Bellmunt J, Bolla M, Joniau S, van der Kwast T, et al. EAU guidelines on prostate cancer. Part 1: Screening, diagnosis, and treatment of clinically localised disease. *Eur Urol.* 2014;65(1):124-37. doi:10.1016/j.eururo.2013.09.046.
15. Thompson IM, Tangen CM, Goodman PJ, Probstfield JL, Moinpour CM, Coltman CA Jr. Long-term survival of participants in the prostate cancer prevention trial. *N Engl J Med.* 2013;369(7):603-10. doi:10.1056/NEJMoa1215932.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license unless stated otherwise in a credit line to the material. Suppose the material is not included in the article's Creative Commons license, and your intended use is not permitted by statutory regulation or exceeds the permitted use. In that case, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2024