Original Article

Examining the Efficacy of PSA Levels in Detecting Prostate Carcinoma among Patients at Pakistan Railway Hospital: A Comparative Analysis

Wajeed Gul Bangash[1], Muhammad Asad[2], Mohammad Roman[1], Muhammad Ismail Seerat[2], Kiran Rehman[2] and Sufyan Rauf[2]

ABSTRACT

Objective: To assess whether testing serum PSA levels ranging from 10 to 4 ng/ml is more effective in detecting prostate cancer compared to measuring serum PSA levels between 20 and 10 ng/ml.

Study Design: A prospective comparative study

Place and Duration of Study: This study was conducted at the Pakistan Railway Hospital, Rawalpindi from June 2022 to December 2022.

Methods: This research involved a comparison among 114 males aged 50 years and above who experienced symptoms related to their lower urinary tract. These individuals were separated into two categories depending on their serum PSA levels, which were determined during the diagnosis process. In Group A, Patients exhibited PSA levels ranging from 10 - 4 ng/ml. While Group B included individuals whose PSA levels ranged from 20 -10 ng/ml. Before taking part in the study, all participants gave their consent in writing. Prostate biopsies were conducted in both groups and prostate cancer incidence was compared.

Results: The average age of the patients was 68.56±4.80 years. Common symptoms reported included urgent urination (26.32%), increased urinary frequency (32.46%), and urination at night (38.60%), weak stream (25.44%), urinary leakage (22.81%), and hematuria (6.14%). Upon examination, findings from digital rectal examination (DRE) showed a lump (30.84%), firm hardness (29.82%), median sulcus obliteration (32.46%), and non-symmetry (22.81%). Both groups studied had similar mean age and occurrences of various lower urinary tract symptoms (LUTS) and DRE findings. The second group (Group-B) demonstrated notably higher average levels of serum prostate-specific antigen (1596±2.72 ng/ml compared to 5.09±1.60 ng/ml; p<0.001), along with greater pre-void (528±94 ml vs. 461±92 ml; p<0.001) and post-void residual volumes (212±56 ml vs. 102±55 ml; p<0.001) in contrast to the initial group (Group-A). Prostate cancer was diagnosed in 28 (24.56%) patients, with the occurrence rate notably higher in Group B (33.33% vs. 15.79%; p=0.029) than in Group A.

Conclusion: PSA levels in the blood can indicate the presence of malignant prostate tissue. This means that if the PSA level is high, it is important to examine the tissue to exclude the possibility of cancer. Studies have shown that there is a relationship between elevated PSA levels at the time of biopsy and an increased incidence of prostate cancer. Therefore, it is recommended to keep an eye on the PSA level and seek medical advice if it is higher than normal.

Key Words: carcinoma of the prostate, Detection effectiveness, screening.

Citation of article: Bangash WG, Asad M, Roman M, Seerat MI, Rehman K, Rauf S. Examining the Efficacy of PSA Levels in Detecting Prostate Carcinoma among Patients at Pakistan Railway Hospital: A Comparative Analysis. Med Forum 2024;35(12):45-49. doi:10.60110/medforum.351209.

INTRODUCTION

[1.] Department of Urology / General Surgery[2], IIMC, Riphah International University,

Correspondence: Wajeed Gul Bangash, Assistant Professor Urology, Riphah International University,
Contact No: 0301-8090807
Email: wajeed.bangash@riphah.edu.pk

Received: March, 2024
Accepted: April-May, 2024
Printed: October, 2024

Carcinoma of the Prostate is a prevalent form found in men worldwide and is recognized as a major contributor to cancer-related fatalities.[1] When assessing symptoms related to the lower urinary tract, it is common practice to conduct a prostate-specific antigen (PSA) blood test along with a digital rectal exam (DRE). When screening for prostate cancer, the PSA test is deemed more dependable compared to solely relying on the DRE and trans-rectal ultrasound.[2] Encountering symptoms related to the lower urinary tract and a reading of prostate-specific antigen (PSA) equal to or higher than 4 ng/ml, it is usually recommended to have a prostate biopsy. This test helps

to check the presence of cancer and to rule out any possible presence of it. Greater than 70% of prostate biopsies done based on high serum PSA levels result in negative with no prostate cancer detection, which is, itself a potentially morbid procedure[3]. To address elevated PSA (prostate-specific antigen) levels, There are three commonly used methods: (1) repeat PSA measurement after empiric antibiotic treatment, (2) repeat PSA measurement 1 to 2 months later, and (3) immediately perform a prostate biopsy[4,5]. In routine PSA screening, more than 90% of localized prostate disease can be detected, and only 4% were detected at a metastatic stage. The burden of disease profile can be used as a disease indicator and a basic tool for planning better strategies. In countries where national testing is not routinely conducted. PSA thresholds may still be used to reduce the number of patients in whom metastatic stages are detected [6, 7]. Several studies that have been conducted remain controversial and have not been able to explain the advantages of PSA screening and the challenges associated with excessive diagnosis and treatment [8]. In Pakistan, unlike developed nations, the utilization of Serum PSA for prostate cancer screening in men aged 50 and above is infrequent. However, in cases where patients exhibit Lower Urinary Tract Symptoms (LUTS), Serum PSA is commonly administered. There is a lack of published literature on the effectiveness of PSA in detecting cancer within the Pakistani population. A high false positive rate of detestation of prostate cancer is observed if the parameter is only serum PSA level-based. Moreover, many variables fluctuate serum PSA levels leading to most of the unnecessary biopsies these include benign prostatic hyperplasia, infections/ inflammation, or different traumatic maneuvers. The findings will allow urologists to predict clinical status and correlate it with PSA levels, as well as identify cases at high risk for carcinoma of the prostate.

METHODS

The urology department, of Pakistan Railway Hospital, Rawalpindi conducted a prospective comparative study. The study lasted for 6 months and was reviewed by an ethical board from June 2022 to December 2022. Two groups were formed, the study involved 114 patients, with 57 cases in each group under examination. The patients for this study were selected through Non-Probability Consecutive Sampling. The study focused on men over the age of 50 who were suffering from symptoms related to the lower urinary tract. Participants meeting particular criteria were selected, with serum PSA levels falling between 4 ng/ml and 20 ng/ml. To ensure reliable results, certain exclusion criteria were applied to minimize potential confounding factors. Individuals who display symptoms of urinary tract problems with prostate-specific antigen (PSA) levels under 4 ng/ml or exceeding 20 ng/ml were excluded from the study. Additionally, Individuals with lower urinary tract symptoms (LUTS) stemming from urological cancers other than the prostate, those who had previously undergone prostate surgery or pelvic radiotherapy, or those facing complications due to urinary blockages (such as bladder stones, kidney damage, and recurrent urinary tract infections) were not included in the research study. A study was conducted on patients with an enlarged prostate and serum PSA level >4 ng/ml. All eligible patients were sorted into two categories: In group A, individuals displayed antigen (PSA) levels from 10-4 ng/ml, while group B exhibited antigen (PSA) levels from 20-10 ng/ml. The study proforma contained demographic characteristics and clinical status of all the patients. Patients were counseled about the biopsy procedure and its associated complications. Both written and informed consent were obtained before the procedure. Biopsy specimens were sent to histopathology for analysis. The TRUS procedure, short for Trans-rectal Ultrasound Scan biopsy, was employed to detect early Carcinoma of the prostate in patients showing symptoms of Lower Urinary Tract and varying levels of Antigen (PSA) through professional diagnostic methods. The procedures were done with proper protocols after giving prophylactic antibiotics plus gut preparation. The biopsy results were documented, and the outcome of the study was determined by comparing the occurrence of prostate cancer in the two groups under investigation in a professional manner. The study investigator conducted all study procedures and data collection personally while being supervised to manage selection bias and uphold data quality and consistency. The study data was inputted and analyzed utilizing SPSS version 17.0. It includes age as one of the numerical variables, PSA levels, and ultrasonography findings in the form of mean ± SD. Clinical symptoms (urinary problems), digital rectal exam outcomes, and tissue samples from biopsies were shown as grouped data using frequency and proportion.

RESULTS

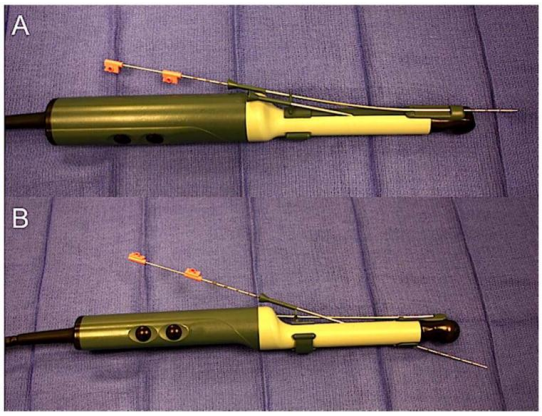
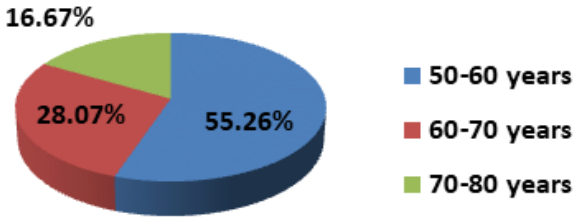


Figure No. 1. Ultrasound biopsy probe end-fire configuration (A) and side-fire configuration (B)



FigureNo. 2: Age group distribution

The age range of participants in both Group A and Group B was between fifty and eighty years, with average ages of 68.40±4.80 years and 68.72±4.78 years, respectively, showing no significant difference (p=0.72). The majority (55.26%) of patients were aged 50-60 years, followed by 28.07% aged 60-70 years, and 16.67% aged 70-80 years. Both groups had a similar distribution of age groups.

When considering symptoms, 26.32% of patients reported urgency, 32.46% reported frequency, and 38.60% reported nocturia. Other common complaints included poor stream (25.44%), dribbling (22.81%), and hematuria (6.14%). The frequency of various LUTS was comparable between the two study groups. DRE findings revealed nodules in 30.84% of patients, firm consistency in 29.82%, obliterated median sulcus in 32.46%, and asymmetry in 22.81%. The frequency of different DRE findings was similar in both groups. The two groups exhibited no significant difference in the reported prostatic volume, with measurements of 53.82±25.83 ml for Group A and 57.12±29.18 ml for Group B (p=0.52). Nevertheless, Group B demonstrated notably higher pre-voidal volumes (528±94 ml compared to 461±92 ml; p<0.001) and post-voidal volumes (212±56 ml versus 102±55 ml; p<0.001) when contrasted with Group A. The mean serum level of prostate-specific antigen measured at 10.53±5.90 ng/ml was notably higher in Group B (15.96±2.72 ng/ml) compared to Group A (5.09±1.60 ng/ml; p<0.001). Prostate cancer was confirmed by biopsy in 24.56% of the subjects, with a significantly higher incidence in Group B (33.33% vs. 15.79%; p=0.029) than in Group A.

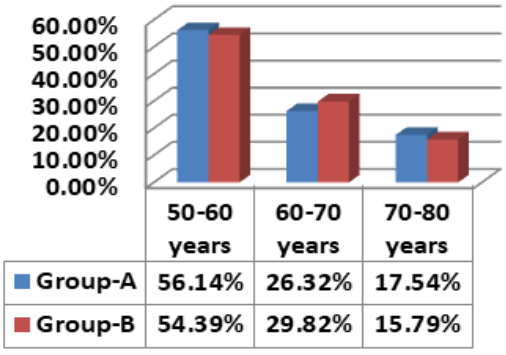


Figure No. 3: Age Groups Distribution of Study in both groups

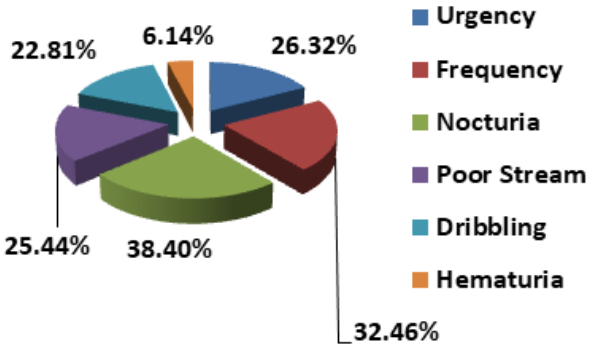


Figure No. 4: Occurrence frequency of various LUTS within the sample population

Figure 4 displays the occurrence frequency of various LUTS within the sample population under examination

Table No. 1: Comparison of various low urinary tract symptoms among the study groups (n=114)

LUTS	Group-A n=57	Group-B n=57	P value
Urgency	15 (26.32%)	15 (26.32%)	1.000
Frequency	20 (35.09%)	17 (29.82%)	0.55
Nocturia	21 (36.84%)	23 (40.35%)	0.70
Poor Stream	14 (24.56%)	15 (26.32%)	0.83
Dribbling	14 (24.56%)	12 (21.05%)	0.66
Hematuria	2 (3.51%)	5 (8.77%)	0.24

Table No. 2: Comparison of various DRE findings among the study groups (n=114)

DRE Findings	Group-A n=57	Group-B n=57	P value
Nodule	19 (33.33%)	23 (40.35%)	0.44
Firm Consistency	16 (28.07%)	18 (31.58%)	0.68
Obliterated Median Sulcus	17 (29.82%)	20 (35.09%)	0.55
Asymmetry	11 (19.30%)	15 (26.32%)	0.37
Estimated Prostate Volume	53.22±25.84	56.57±29.15	0.52

DISCUSSION

Detection of prostate cancer through PSA levels can sometimes be inaccurate due to a high number of false-positive outcomes. This issue arises because other conditions like benign prostate enlargement, inflammation, infection, or physical manipulation of the prostate gland can also influence PSA levels.

Consequently, unnecessary biopsies might be carried out. The primary objective of this study is to determine the incidence of prostate cancer detected through biopsy among patients with various levels of serum PSA and to explore the relationship between elevated PSA concentrations and malignant prostate growths.

This research is the first of its kind among our local population. It has discovered a direct correlation between elevated levels of serum prostate-specific antigen (PSA) and a notably increased incidence of prostate cancer upon biopsy. Thus, it can be inferred that serum PSA levels serve as an indicator of cancerous prostatic tissue, with higher levels warranting further examination of the tissue to rule out malignancy. However, a notable drawback of the study was the absence of a comparison of the treatment outcomes of these patients based on their initial PSA levels. The analysis in question could have provided insight into the potential of serum PSA in predicting the prognosis of the disease. Conducting a study of this nature would aid in categorizing patients based on risk upon presentation, facilitating better management and enhancing patient outcomes. We strongly advocate for the

The average age of patients experiencing Lower Urinary Tract Symptoms (LUTS) was around 68.56±4.80 years as noted. Similarly, a significant association between increased age, particularly above 60 years, and the risk of prostate cancer, was documented in previous studies[9]. Similarly, Kant et al[10] studies contributed to understanding prostate health in South Indian men the average ages reported for Indian patients suffering from Lower Urinary Tract Symptoms (LUTS) were found to be almost the same as our study. While Isiwele et al. [11] investigated the correlation between Digital Rectal Examination (DRE) findings and histopathological results in Nigerian men suspected of having prostate diseases also noted an average age of 66.9±5.7 years for patients with LUTS in Nigeria.

The most common complaints among men in this study were urgent urination (26.32%), frequent urination (32.46%), nighttime urination (38.60%), weak stream (25.44%), urinary leakage (22.81%), and hematuria (6.14%). Ojewola et al.[12] a study conducted on Nigerian men revealed similar findings, showing prevalence rates of urgent urination (26.0%), frequent urination(32.7%), urination at night (38.4%), weak stream (25.1%), urinary leakage (22.6%), and hematuria (6.9%). Awan et al[13] stress the critical role of hematuria as a potential symptom of urological malignancies and advocate for prompt and comprehensive diagnostic assessments to ensure early detection and treatment. Ahmed et al[14] noted a similar incidence and emphasized that urgency, frequency, dribbling, incontinence, and nocturia were common among patients with prostatic lesions, at Dow Medical College, Hospital in Karachi.

Comparison between Group A and Group B showed significant, differences in average levels of prostate-specific antigen in the bloodstream showed significant differences at 15.96±2.72 ng/ml compared to 5.09±1.60 ng/ml with a p-value of less than 0.001., as well as the volume of residual urine before urination (528±94 ml compared to 461±92 ml; $p<0.001$) and after urination (212±56 ml compared to 102±55 ml; $p<0.001$) were analyzed. Group B demonstrated notably higher values than Group A. According to Saifullah et al[15], Patients diagnosed with benign prostatic hyperplasia (BPH) with increased prostate volume are associated with higher residual urine volumes, which can contribute to LUTS and may indicate underlying prostatic pathology. Ko & Kim et al[16] demonstrated that as PSA screening became more frequent, treatment decisions evolved and likely led to even earlier detection, potentially impacting treatment patterns. However, Bansal & Gill et al[17] found a similar or higher detection rate, which could reinforce the validity of using PSA, DRE, and TRUS together. According to Özbey & Öztorun et al [18,] Some prostate cancers are missed and only diagnosed after TURP reported even higher rates among such patients in Turkey.

CONCLUSION

The quantity of prostate-specific antigen (PSA) in the bloodstream is the strongest match of malignant prostate tissue. A high PSA level should prompt action, such as performing a histopathological examination of tissue to rule out malignancy. By recognizing the significance of PSA levels, we can take a proactive approach to safeguard our health and well-being.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Wajeed Gul Bangash, Muhammad Asad
Drafting or Revising Critically:	Mohammad Roman, Muhammad Ismail Seerat, Kiran Rehman, Sufyan Rauf
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: NO.RIPHAH/IRC/25/1053 dated 13.05.2024

REFERENCES

1. Okpua NC, Okekpa SI, Njaka S, Emeh AN. Clinical diagnosis of prostate cancer using digital rectal examination and prostate-specific antigen

tests: a systematic review and meta-analysis of sensitivity and specificity. Afri J Urol 2021;27:1-9.
2. Villavicencio MA, Suarez CE, Fiallos DL. Importance of rectal examination of prostate in primary care. Neuro Quantol 2022;20(13):176.
3. Taha DE, Aboumarzouk OM, Koraiem IO, Shokeir AA. Antibiotic therapy in patients with high prostate-specific antigen: Is it worth considering? A systematic review. Arab J Urol 2020;18(1):1-8.
4. Nawaz A, Manan F, Minallah N, Rehman KU. Effect of empirical antibiotic treatment on prostate-specific antigen in men with borderline raised serum prostate-specific antigen. J Rehman Med Inst 2023;9(1):20-2.
5. Hayat NU, Fiaz S, Hamza Ashraf MS, Azhar K, Khan T. Role of antibiotics in raised serum prostate-specific antigen (PSA) level in KPK. In Med Forum 2021;32(4):157.
6. Wang J, Xia HH, Zhang Y, Zhang L. Trends in treatments for prostate cancer in the United States, 2010-2015. Am J Cancer Res 2021;11(5):2351.
7. Kuss K, Adarkwah CC, Becker M, Donner-Banzhoff N, Schloessler K. Delivering the unexpected—Information needs for PSA screening from Men's perspective: A qualitative study. Health Expectations 2021;24(4):1403-12.
8. Lumbreras B, Parker LA, Caballero-Romeu JP, Gómez-Pérez L, Puig-García M, López-Garrigós M, et al. Variables associated with false-positive PSA results: A cohort study with real-world data. Cancers 2022;15(1):261.
9. Malik SS, Batool R, Masood N, Yasmin A. Risk factors for prostate cancer: A multifactorial case-control study. Current Problems in Cancer 2018;42(3):337-43.
10. Kant P, Inbaraj LR, Franklyn NN, Norman G. Prevalence, risk factors and quality of life of Lower Urinary Tract Symptoms (LUTS) among men attending Primary Care slum clinics in Bangalore: A cross-sectional study. J Family Med Prim Care 2021;10(6):2241-2245.
11. Isiwele EM, Essiet A, Irabor GI. Correlation of digital rectal examination findings with findings on histopathology of the prostate in patients with suspected prostate cancer. Int J Contemp Med Res 2018;5(7):G12-G16.
12. Ojewola RW, Oridota ES, Balogun OS, Ogundare EO, Alabi TO. Lower urinary tract symptoms: prevalence, perceptions, and healthcare-seeking behavior amongst Nigerian men. World J Mens Health 2016;34(3):200–8.
13. Awan SU, Bhatti AN, Fakhr A, Awan AN, Fiyyaz H. Frequency of Urological Carcinomas Presenting as Gross Haematuria in Punjab Pakistan and Recommendation for its Early Diagnosis: Urological Carcinomas Presenting As Gross Haematuria. Pak Armed Forces Med J 2018;68(2):363-68.
14. Ahmed N, Misbah S, Waseem J. Spectrum of Prostate lesions at Dow Medical College: A 5-year Study. BAOJ Pathol 2019;2:016.
15. Saifullah BR, Gilani S, Asif H, Hasan Z, Sharif Z. Sonographic Association of Prostate Volume with Post Micturition Residual Volume in Benign Prostate Hyperplasia. RADS J. Pharm. Pharm. Sci 2018;6(2):107-12.
16. Ko YH, Kim SW. Influence of repeated prostate-specific antigen screening on treatment pattern in a country with a limited social perception of prostate cancer: Korean national wide observational study. Invest Clin Urol 2021;62(3):282.
17. Bansal N, Gill MK. Comparison of Diagnostic Yield of Digital Rectal Examination, Serum Prostate Specific Antigens, Transrectal Ultrasound with Histopathology of Prostate. J Res Med Educ Ethics 2018;8(1):74-8.
18. Özbey C, Öztorun K. Frequency of incidental cancer in transurethral prostate resection materials and our clinical approach to these patients; a retrospective file scan. Kafkas J Med Sci 2019;9(1):11-6.