

Emerging Prevalence of Prostate Cancer Using Serum PSA

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Abstract

Prostate cancer is a major public health concern worldwide, with its burden increasing particularly in sub-Saharan Africa. Prostate-specific antigen (PSA) testing remains an important biomarker for early detection and monitoring, although its diagnostic specificity is limited. This study aimed to assess the emerging prevalence of PSA levels. A cross-sectional study was conducted with serum PSA levels categorized as normal (≤ 4.0 ng/mL), borderline (4.1–10.0 ng/mL), or high (>10.0 ng/mL). Age groups were stratified into <40 years, 41–50 years, and >50 years. Descriptive statistics were used to summarize findings, and chi-square analysis tested associations between age and PSA levels. Results showed that 45.0% of patients had normal PSA levels, 20.0% had borderline values, and 35.0% showed high PSA levels. Among men younger than 40 years, all (100%) had normal PSA levels. In the 41–50 years group, 33.3% were normal, 25.0% borderline, and 41.7% high. In those above 50 years, 44.8% were normal, 20.0% borderline, and 35.2% high. Although descriptive analysis revealed higher prevalence of abnormal PSA with advancing age, the chi-square test showed no statistically significant association between age group and PSA level ($\chi^2 = 4.334$, $p = 0.363$). In conclusion, a substantial proportion of patients presented with borderline or elevated PSA values, particularly among men aged over 50 years. These findings reinforce the established age-related increase in prostate disease risk and highlight the importance of PSA testing for early detection and monitoring, while the absence of a statistically significant association underscores the need for larger, multi-center studies to validate these patterns.

Keywords: Emerging, Prevalence, Prostate, Antigen, PSA

Introduction

Prostate cancer is one of the most prevalent malignancies affecting men globally and remains a leading cause of cancer-related morbidity and mortality [1]. According to epidemiological data, it is the second most frequently diagnosed cancer in men and the fifth leading cause of cancer death worldwide, with its incidence projected to rise further due to increasing life expectancy and improved detection [2]. The disease exhibits a marked geographical variation, with higher incidence rates in North America, Europe, and parts of Oceania, compared to lower reported rates in Asia and Africa. However, the lower figures in some regions may reflect underdiagnosis rather than true differences in prevalence, owing to limited screening facilities and delayed presentation [3].

The introduction of prostate-specific antigen (PSA) testing revolutionized prostate cancer screening and diagnosis in the late 20th century. PSA, a glycoprotein produced by prostatic epithelial cells, is normally present at low concentrations in the blood of healthy men but may rise significantly in the presence of prostate cancer, benign prostatic hyperplasia (BPH), or prostatitis [4]. The test is valued for its sensitivity, as it often detects early-stage cancers before they become clinically apparent [1]. Nevertheless, its specificity is limited since elevated PSA does not exclusively indicate malignancy. This has generated debate on its utility, particularly in screening asymptomatic men, as it may lead to unnecessary biopsies and overtreatment [2].

Age-related variation in PSA values adds another dimension to the interpretation of results. Oesterling et al. [4] demonstrated that PSA levels naturally increase with advancing age, largely due to benign

prostatic enlargement. As such, the use of uniform PSA cut-off values across all age groups can result in false positives in older men and false negatives in younger men. Age-specific reference ranges have therefore been recommended to improve diagnostic accuracy and reduce unnecessary invasive procedures. Despite these refinements, PSA levels in the borderline or “gray zone” (4.1–10.0 ng/mL) remain clinically ambiguous, as cancer risk in this range is intermediate and variable [1].

In sub-Saharan Africa, the burden of prostate cancer appears particularly severe. Hospital-based studies in Nigeria have consistently shown that many men present with advanced disease, often reflected in markedly elevated PSA values at the time of diagnosis [3,5]. The high proportion of elevated PSA levels in these populations has been attributed to factors such as lack of widespread screening programs, cultural barriers to early health-seeking behavior, and limited access to specialized healthcare services. This contrasts with findings in Western countries, where population-based PSA screening programs have contributed to earlier detection, though at the expense of concerns regarding overdiagnosis and overtreatment [2].

Furthermore, genetic and environmental differences may influence PSA levels and prostate cancer risk across populations. Evidence suggests that men of African descent have higher baseline PSA values and are at increased risk of aggressive forms of prostate cancer compared to Caucasian or Asian men [5]. This makes region-specific studies of PSA distribution crucial in informing screening guidelines and clinical management tailored to local populations.

Materials and Methods

Study Area

This study was carried out at the Jos University Teaching Hospital (JUTH), a tertiary health facility located in Jos, the capital city of Plateau State in North-Central Nigeria. JUTH serves as a referral center providing specialized health services for patients within Plateau State and surrounding states, including Bauchi, Benue, Nasarawa, Taraba, and parts of Kaduna. The hospital is also a training and research center for medical students, postgraduate trainees, and other health professionals.

Jos lies within the Jos Plateau and is situated at an elevation of about 1,238 meters above sea level. The city is geographically located between latitude 9°55'N and longitude 8°54'E. The climate is generally temperate compared to most parts of Nigeria, which contributes to health-seeking behaviors and influences the spectrum of diseases reported in the region.

Study Design

This study employs a hospital-based cross-sectional descriptive study conducted using retrospective data. The design was chosen to determine the prevalence of abnormal Prostate Specific Antigen (PSA) levels and their distribution across different age categories among male patients who attended Jos University Teaching Hospital during the study period.

Study Population

The study population consisted of male patients who attended Jos University Teaching Hospital and underwent PSA testing during the study period. Inclusion criteria were men aged 18 years and above who had serum PSA results documented in the hospital records. Patients with incomplete records, duplicate entries, or

inconclusive laboratory results were excluded.

Data Collection

Data were obtained from the hospital's laboratory information management system and patient records in the Pathology and Urology departments. Relevant variables extracted included Patient age and serum PSA levels (ng/mL). The data collection was carried out with strict adherence to patient confidentiality. Each record was anonymized before analysis.

Data Analysis

Data were entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize the data, including frequencies and percentages. The prevalence of PSA categories (normal, borderline, and high) was determined. A cross-tabulation was performed to examine the association between age groups and PSA categories. The Chi-square test (χ^2) was used to test for statistical significance, with a p-value of <0.05 considered statistically significant. Results were presented in tables and figures for clarity.

Results

Table 1 presents the distribution of prostate-specific antigen (PSA) levels among 180 patients. The results showed that 45.0% had PSA values within the normal range (≤ 4.0 ng/mL), indicating no significant biochemical evidence of prostate malignancy, 20.0% fell into the borderline range (4.1–10.0 ng/mL), which may suggest a risk that requires closer monitoring and possibly further diagnostic evaluation and about 35.0% had high PSA levels (> 10.0 ng/mL), strongly suggestive of possible prostate cancer or other prostatic pathology.

Table 2 examines PSA prevalence across age groups. Among patients below 40 years, all 3/3 (100%) had normal PSA values, suggesting that prostate disorders are rare in younger men. In the 41–50 years age group, only 33.3% had normal PSA, while 25.0% were borderline and 41.7% were high, showing a rising prevalence of abnormal PSA levels as age advances. The majority of cases were found in patients above 50 years, where 44.8% were normal, 20.0% borderline,

and 35.2% high. This demonstrates that the prevalence of elevated PSA is significantly higher in older individuals, aligning with the established understanding that prostate cancer risk increases with age.

The chi-square test ($\chi^2=4.334$, $p=0.363$) indicates no statistically significant association between age group and PSA levels in this sample, though the descriptive trends clearly show higher prevalence among older age groups.

Table 1: Prevalence of Prostate Among Patients Attending Jos University Teaching Hospital

S/N	PSA Range	Freq (%)
1	Normal	81 (45.0%)
2	Borderline	36 (20.0%)
3	High	63 (35.0%)
4	Total	180 (100%)

Key: Normal range ≤ 4.0 ng/mL, Border line=4.1 – 10.0 ng/mL, High= > 10.0 ng/mL

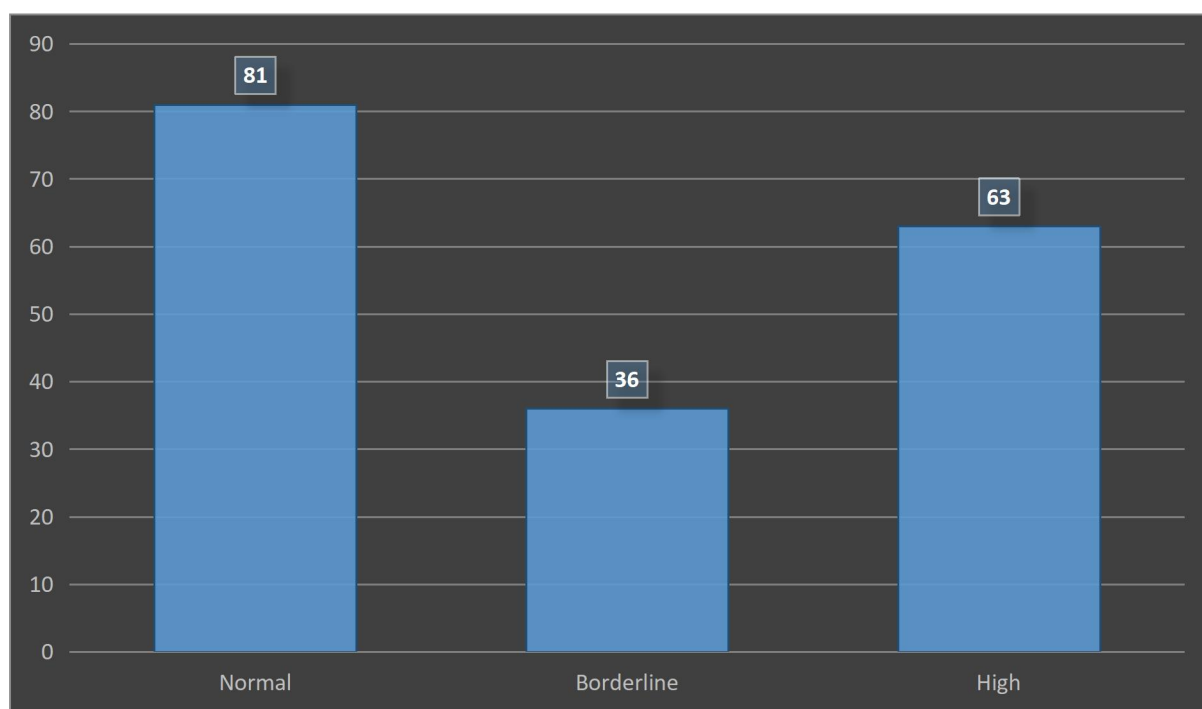


Figure 1: Prevalence of Prostate Among Patients Attending Jos University Teaching Hospital

Table 2: Age Distribution of Prostate Specific Antigen (PSA) Levels

Age Group (Years)	No. Examined	Normal (%)	Borderline (%)	High (%)
Less than 40	3	3 (100.0)	0 (0.0%)	0 (0.0)
41–50	12	4 (33.3)	3 (25.0)	5 (41.7)
Above 50	165	74 (44.8)	33 (20.0)	58 (35.2)
Total	180	81 (45.0)	36 (20.0)	63 (35.0)

($\chi^2=4.334$, p-value=0.363)

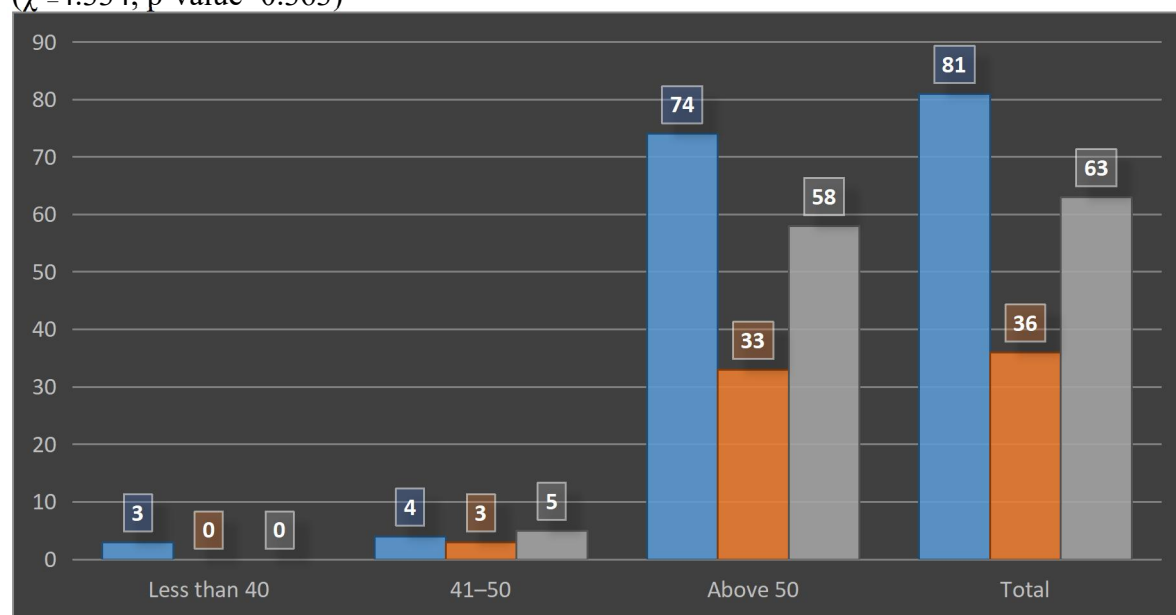


Figure 2: Age Distribution of Prostate Specific Antigen (PSA) Levels

Discussion

This study revealed the emerging prevalence of prostate cancer among patients attending Jos University Teaching Hospital using serum PSA. About 45.0% of the 180 patients had PSA values within the normal range (≤ 4.0 ng/mL), while 20.0% fell within the borderline range (4.1–10.0 ng/mL) and 35.0% had high PSA levels (>10.0 ng/mL). This distribution indicates that more than half of the patients presented with abnormal PSA values, suggesting a considerable burden of prostate disorders within the study population. These findings are broadly consistent with the study by Okeke et al. [3] in Nigeria, who reported a high proportion of patients with PSA >10 ng/mL, attributing

this to late presentation and poor access to early screening, while Western screening studies by Ciatto et al. [2] reported much lower abnormal PSA rates (around 15–20%). The higher prevalence in this study may therefore reflect differences in study population and health-seeking behavior.

The prevalence in relation to age showed that all patients under 40 years had normal PSA levels, which agrees with the findings of Oesterling et al. [4], who showed that clinically significant PSA elevation is rare in younger men. In contrast, in the 41–50 years age group, only 33.3% of patients had normal PSA values, with the majority

showing borderline or high levels. This pattern of rising PSA with age mirrors observations from Osegbe et al. [5] in Nigeria and Catalona et al. [1] in the United States, both of whom demonstrated a clear age-dependent increase in PSA and prostate cancer prevalence. In patients above 50 years, more than half (55.2%) had abnormal PSA levels, reinforcing the established understanding that advancing age is the strongest risk factor for prostate cancer and other prostate pathologies.

The proportion of patients with borderline PSA (20.0%) falls within the range described in prior research. Catalona et al. [1] noted that roughly 25–35% of men with PSA in this “gray zone” are later confirmed to have prostate cancer, highlighting the need for additional diagnostic evaluation in this subgroup. Similarly, the 35.0% of patients with PSA >10 ng/mL observed here is higher than in most population-based studies (where such levels are typically <10%) but aligns with findings from Okeke et al. [3] and other African cohorts, which often report higher values due to delayed clinical presentation.

Although descriptive trends in this study show a clear increase in PSA abnormalities with age, the chi-square test ($\chi^2=4.334$, $p=0.363$) did not reveal a statistically significant association between age and PSA levels. This differs from larger studies, such as those by Oesterling et al. [4], which established strong statistical associations between age and PSA. The lack of significance in the present study may be due to the relatively small sample size within each age group or the distribution of patients. Nonetheless, the age-related pattern remains consistent with the biological and epidemiological evidence documented globally.

Conclusion

This study demonstrated that while nearly half of the patients had PSA levels within the normal range, a substantial proportion (55.0%) presented with borderline or high PSA values, suggesting a significant burden of prostate pathology in the studied population. Abnormal PSA levels were rare among men under 40 years but increased markedly with age, particularly after 50 years, in line with global evidence that prostate cancer risk rises with advancing age. Although the statistical association between age and PSA levels was not significant, the descriptive trends reinforce the importance of age as a determinant of PSA elevation. The relatively high prevalence of abnormal PSA values compared with population-based studies highlights the likelihood of late presentation in hospital-based cohorts. These findings underscore the need for early detection strategies, public awareness campaigns, and routine screening, especially in older men, to improve timely diagnosis and management of prostate diseases.

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