Original Research Article

Prostate glands and prostate specific antigen study in a teaching hospital

Rajendra Kumar[1],Aakash, MD[2],Narayan Kumar Joshi[3]

[1]Associate Professor, Department of Pathology,Narayan Medical College & Hospital, Jamuhar, Rohtas district, Bihar, India

[2]Assistant Professor, Department of Pathology,Narayan Medical College & Hospital, Jamuhar, Rohtas district, Bihar, India

[3]Assistant Professor, Department of Community Medicine,Narayan Medical College & Hospital, Jamuhar, Rohtas district, Bihar, India

Received: 21-04-2021 / Revised: 13-06-2021 / Accepted: 13-07-2021

Abstract

Background: Prostate carcinoma lesion is a global phenomenon causing morbidity and mortality in old males.Prostate specific antigen is gamma semino-protein secreted from epithelial cells, is a specific marker in screening of prostate lesions. Marked elevation of enzyme level beyond normal suggests neoplasia of organ. In non-neoplastic conditions also, mild to moderate elevation observed. The analysis of variation in its value will be of help to the consultants of this region to assess about different lesions of prostate. **Method:** The study was carried out from January 2016 to December 2018 retrospectively. Prostate specimens of simple and transurethral resections were sorted out from the specimens received in the pathology department. Haematoxylin and eosin stained slides were reviewed and diagnosed. Preoperative prostate specific antigen value of these cases analyzed statistically with relation to different diagnosed pathologies. **Results:** In this period, 103 cases of prostate lesion were included. Prostate adenocarcinoma emerged the highest (81 %) among noplastic lesions (10.6 %) followed by some rarer tumors e.g. sarcomatoid carcinoma and hemangiopericytoma. Among non-neoplastic conditions (89.4 %), benign nodular hyperplasia was the commonest finding (69.9 %). Prostate specific antigen value were markedly elevated in malignant cases with over 20 ng/ml in 8/11 cases, which is significant. Values above 20 ng/ml was detected in 8/92 cases. **Conclusion:** Adenocarcinoma is the most common malignant tumour of prostate above 65 years of age whereas benign nodular hyperplasia is the commonest affliction among males above 45 years. Prostate specific antigen above 20 ng/ml has definite relation with prostate carcinoma..

Keywords: Prostate specific antigen, benign nodular hyperplasia, prostate adenocarcinoma

Introduction

Prostate specific antigen is also known as gamma-seminoprotein. Prostate gland is a secondary organ of male reproductive system. Prostate specific antigen (PSA) is secreted from glandular lining epithelial cells of this organ. In advancing age, lesions from inflammation, irritation, hyperplasia to neoplasia affects and level rises. Its level is within normal range in healthy young individuals but as the age advances, usually around 40 years, the level gradually rises above 4 ng/ml. Increased PSA levels are seen in all prostatic diseases but markedly elevated levels are indicative of carcinoma prostate. Carcinoma of the prostate is the most common form of malignancy in men followed closely by lung cancer and is the second leading cause of cancer death. PSA is prostate specific marker and is being used as a serological and immuno-histochemical marker [1].

It is considered as most effective test currently available for detection of carcinoma prostate and predicting tumour recurrence before its detection by any other method [2]. As the person becomes older serum PSA level rises which is not a prostate disease specific marker. PSA level can increase in non-malignant conditions and in diagnostic and surgical procedures as well. These conditions can mimic cancer and gives a cloudy picture during diagnosis before histopathology confirmation especially in prostate carcinoma where PSA is used as a screening test [3]. It is an important biomarker and in most cases of malignancy it elevates. However, its level of increase does not indicate specificity for prostate carcinoma. It gives the most remarkable aspect of the prostate that both benign and malignant tumours are hormone (androgen) dependent and are associated with considerable morbidity and mortality [4]. While some of them have found positive association which is statistically significant, though not noteworthy, some of them have not reached the same conclusion. The issue still remains unresolved [5]. However, some ongoing research has helped in understanding of biology and genetics, and marked improvement is in diagnosis and treatment of cancer [6]. In the differential diagnosis between benign nodular hyperplasia (BNH) and adenocarcinoma prostate, alternative methods of interpreting the PSA are being considered [7]. During examination by digital rectal, clinical points are revealed and preoperative PSA estimation is advised. It is valuable to monitor it periodically in high risk cases and cancers. The present study was undertaken to know the prevalence of lesions of prostate and its association with values of PSA and to assess a correlation between increasing PSA levels and neoplastic lesions of prostate, of this newly constituted institute.

Material and Methods

The retrospective study was conducted for a period of 3 years from January 2016 to December 2018 in the Department of Pathology of Narayan Medical College & Hospital, Jamuhar, Rohtas district, Bihar, India. Prostate specific antigen values for related cases of Biochemistry department were retrieved from records and analyzed.

**Correspondence*
Dr.Rajendra Kumar
Associate Professor,Department of Pathology,Narayan Medical College & Hospital, Jamuhar, Rohtas district, Bihar, India
E-mail: neerurkumar@rediffmail.com

The study was initiated after approval by the Ethics committee of the institute.

Inclusion Criteria

The biopsy specimens of prostate gland with only histopathology confirmed slides having prostate specific antigen value were taken into consideration.

Exclusion Criteria

- The degenerated and improperly fixed tissues.
- Faint stain slides.
- Doubtful cases of prostate with unsatisfactory history and
- Scribbled investigation findings were excluded from study.

The prostate specimens were received in the department of pathology.These included simple, radical prostatectomy and adequate no. of transurethral resection of prostate (TURP) biopsies. The case history of these was retrieved and data related to age, clinical complaints, duration of lesion and investigation findings such as ultrasonography and CT findings were collected from records of indoor papers and biopsy requisition forms. The tissues were fixed in 10 % formalin overnight. Grossing of tissues were done under standard protocol and detailed features noted. Small tissue bits were taken and processed properly. After paraffin embedding, sections of 4 micron were taken with semi-automated microtome in histopathology section of the department. Tissue sections stained with haematoxylin& eosin by conventional method. Special stains were applied when required. The microscopic review was done with advice of other senior pathologists. The total serum PSA of these cases were analyzed by Erba automated analyzer and Bios enzyme-linked immunosorbent assay (ELISA) kit for PSA quantitative test. The datas were collected and meticulously entered in Microsoft excel 2007. The frequency of prostate lesions, age of presentation and PSA levels are expressed in the form of tables/charts and photographic documentation.

Statistics

The datas were analyzed using two tailed student's t-Test. Value of P <0.05 was considered significant.

Results

In the present retrospective study during this period it came to 103 cases, after exclusion of five cases due to different reasons – lack of proper data, improper stain character and scrawled PSA value. The highest age 84 years was ascertained and 44 years as the least age. Analysis of age group revealed 50-60 years as the most common while 60-70 years following it. This is depicted in **Table 1**. The average age of presentation of non-neoplastic cases (89.32 %) appeared to be 62.7 years while that of neoplastic cases (10.67 %) was calculated as 75.1 years. The mean age of various prostate lesions diagnosed in this study is shown in **Table 2**. The age range of 63-84 years was ascertained among malignant cases.

Table 1: Distribution of cases in various age groups

Age group	No. of cases	% of cases
40-50 year	10	09.70
50-60 year	42	40.77
60-70 year	35	33.98
70 -80 year	14	13.59
>80 year	02	01.94
Total	103	100%

Table 2: Average age of presentation of various lesions of prostate

Lesions of prostate	No. of cases	Mean age of presentation (in yr.)
Benign nodular hyperplasia (BNH)	72	59.6
Chronic prostatitis & BNH	14	61.4
Prostatic intraepithelial neoplasia	06	67.3
Adenocarcinoma	09	71.4
Hemangiopericytoma	01	71
Sarcomatoid carcinoma	01	83

Prevalence of prostate cases with different pathologies diagnosed is shown in **Figure 1**. Among non-neoplastic cases, benign nodular hyperplasia emerged the commonest in this series (69.90%). This was followed by cases of BNH with chronic prostatitis which came out to be (13.59 %). It includes one case with multiple cystic changes in glandular part of prostate shown in **Figure 2**. No case of acute inflammation or granulomatous lesion was detected. Some cases of prostate intraepithelial neoplasia (PIN) were also seen in the study (05.82 %).

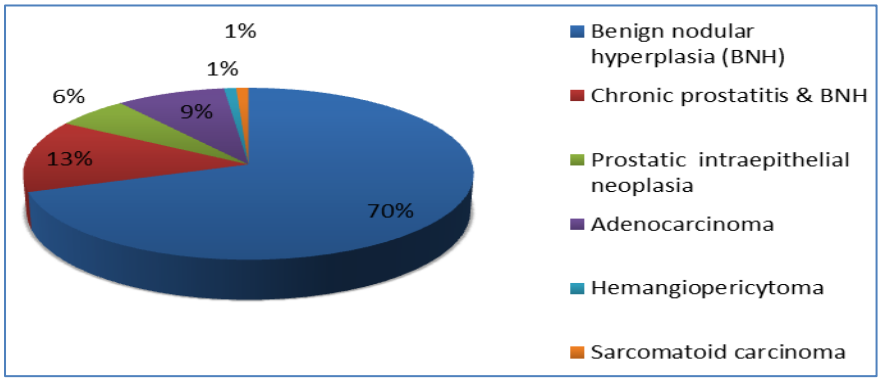

Fig 1:Prevalence of prostate cases with different pathologies diagnosed.

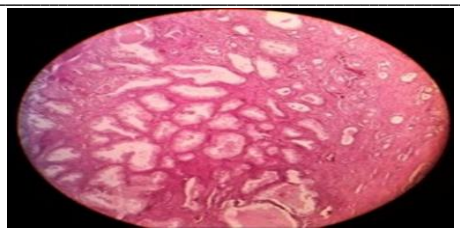

Fig 2: A case with multiple cystic changes in glandular part of prostate (H & E, 100x).

Most of malignant cases were of adenocarcinoma (81.81 %) in this study. A case of prostate adenocarcinoma was detected having foamy cytoplasm of malignant cells and evidence of perinuclear invasion in a 69 years case (**Figure 3**). Some rarer cases were also diagnosed in this series like hemangiopericytoma and sarcomatoid carcinoma. Each one of these was confirmed in a 71 years and 83 years patient.

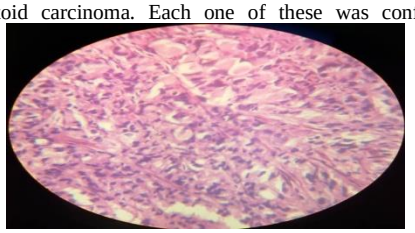

Fig 3: A case of prostate adenocarcinoma with foamy cytoplasm and peri-nuclear invasion (H & E, 100x).

The prostate lesions with PSA values was calculated and documented in **Table 3** dividing in different levels of 0-4 ng/ml, 4.1-10, 10.1-20 and > 20 ng/ml. It also shows mean PSA ±SD with range of values. In BNH around 57 % cases showed PSA value in the range 4.1-10, followed by 21 % having 10.1-20 ng/ml. The PSA value was not significantly raised in 13 cases with 0-4 ng/ml. It was markedly raised in three cases above 20 ng/ml. BNH with chronic prostatitis cases had highest no. of cases (50 %) in the range of 10.1-20 ng/ml; followed by the range of 4.1-10 ng/ml. Among cases of prostate intraepithelial neoplasia, four cases (66.6 %) showed marked elevation above 20 ng/ml.

Table 3:Cases of diagnosed prostate lesions with distribution of PSA values

Prostate lesions	0-4ng/ml	4.1-10ng/ml	10.1-20ng/ml	>20ng/ml	Mean±*SD*	Range of values
Benign nodular hyperplasia (BNH)	13	41	15	3	9.47±6.23	2.6-31.2
Chronic prostatitis & BNH	1	5	7	1	13.47±7.35	3.0-32.7
Prostatic intraepithelial neoplasia	0	0	2	4	28.01±10.74	14.8-45.6
Adenocarcinoma	0	2	1	6	59.78±38.12	7.2-104.7
Hemangiopericytoma	0	0	0	1	147±00	147
Sarcomatoid carcinoma	0	0	0	1	155±00	155

The most common prostate adenocarcinoma cases (67 %) had PSA value above 20 ng/ml including three cases around 100 ng/ml, while two cases had mild and one case had moderate elevation. Other malignant cases of hemangiopericytoma and sarcomatoid carcinoma showed markedly elevated PSA values about 150 ng/ml. The various prostate pathologies diagnosed with their mean age of presentation were found to be significant (P= 0.0012). The mean PSA value of histopathologic findings of non-neoplastic and neoplastic cases were also found to be statistically significant (P= 0.0288).

Discussion

Males around the age of 40 years and above are responsible persons of family and society. The pathological distress hampers them in discharging their duties. Prostate carcinoma becomes an important cause of morbidity and finally mortality occurs. The commonest age group involved in this series came out to be 50-60 years followed by 60-70 years. Similar trend was ascertained in other studies [8]. The mean age appeared 68.9 years in agreement of Patwardhan et al who declared 64 years in their study and Yanai et al found it as 76 years [9,10].Sufficient no. of literatures is available in this country as well as abroad revealing BNH as the highest no. of cases. In this series BNH was diagnosed in 69.9 % cases. Some of the studies has shown similar outcome which showed 73.5 % and 73/9 % [11,12]. Inflammatory involvement of prostate is not uncommon in old age group as it is intimated with urinary tract. It was ascertained in almost 13.6 % cases in this study. It was found 28.7 % and 32.6 % in other studies [5,13]. Diagnosis of prostatic intraepithelial neoplasia was 5.82 % in this series. Deepak et al assessed it in 1.67 %, whereas Chukwuemeka et al found it in 11 % cases [11,14]. Cystic changes was diagnosed in a case. It occurs in the prostate and multiple cysts of varying size are observed infrequently. A total non-neoplastic case diagnosed in a study was 62.72 % whereas our study observed it in 89.32 %. Prostate carcinoma was ascertained in 10.6 % cases in this series. It was determined 6.87 % in a study, whereas Khant et al diagnosed in 37.2 % cases in their studies [15,16]. In some other studies it was ascertained 18.2 % [11]. Among the prostate carcinoma, adenocarcinoma emerged as the most common and was diagnosed in 9/11 cases in this series. Various literatures are available which observed adenocarcinoma as most common prostate carcinoma except some rare tumours e.g. hemangiopericytoma, sarcomatoid carcinoma as observed in this study.Serum PSA value were estimated preoperative and normal range of 0-4 ng/ml was seen in 13.6 % cases, mild 4.1-10 ng/ml in maximum no. of patients 46.6 %, moderate level of 10.1-20 ng/ml in 24.27 % and remaining 15.53% had elevation >20 ng/ml. Kavita et al found 40.2 % of cases with up to 10 ng/ml and 15.2 % cases having between 10-20 ng/ml but 44.4 % had >20 ng/ml.[2] The PSA level among BNH cases was maximum in 4.1-10 ng/ml in this study which is in agreement with the findings of Hirachand et al and Khant et al [3,16]. Normal PSA value was evaluated in 21.2 % cases in BNH in a study, whereas 18 % was within normal range in this series [17]. In the condition of inflammatory process usually affecting urinary tract, it involves glandular epithelium of the prostate gland which is relatively common in old age cause rise of PSA level above 4.0 ng / ml [7]. Most of the cases of chronic prostatis& BNH was seen in the range

of 0-7 ng/ml in a study which is similar to outcome of this study and the largest no. of PIN finding was >20 ng/ml in this series in agreement with Kavita et al and Banerjee et al [2,5]. Men with prostate cancer were slightly older with significantly higher mean PSA [18]. Prostate carcinoma cases (8/11) had mostly >20 ng/ml PSA value in this study. Similar were findings in studies of Hirachand and Khant et el [3,16]. There is significant positive correlation between age and serum prostate specific antigen level [19]. Most of the patients can be secure of benign lesion below 4 ng/ml and thus morbidity related with the surgical biopsy can be prevented but when the PSA value is more than 100 ng, biopsy procedure becomes compulsory as there is definite chance of cancer involvement [20].

Conclusion

The retrospective study of prostate gland lesions and their PSA value in this teaching hospital revealed BNH as the commonest disease afflicting around 45 years in males. Among the neoplasia, adenocarcinoma emerged as the most common involving around 60 years of age. PSA assessment is helpful and mild to moderate elevation >4 ng/ml occurs in non-neoplastic whereas moderate to mostly high levels were assessed in cancerous conditions. Markedly elevated value of PSA >20 ng/ml for age indicates biopsy microscopic study related to malignancy. Consulting clinician and present for screening tests from 40 years of age will be beneficial for individuals, however; discovery of a specific marker for the prostate cancer is the need of the hour.

References

1. Chopra GS, Bindal RK, Kotwal SV, Rai R, Bhardwaj JR. Importance of prostate specific antigen (PSA) in clinical practice: our experience. Med J Armed Forces India. 1998; 54 (3): 215-218.
2. Kumari K, Sharma N, Sharma SK, Jaswal S, Barwal K. Correlation of serum PSA level with histomorphologic study in prostatic diseases. Indian J PatholOncol. 2018; 5(4):613-618.
3. Hirachand S, Dangol UMS, Pradhanang S, Acharya S. Study of prostatic pathology and its correlation with prostate specific antigen. Journal of Pathology of Nepal. 2017; 7:1074-77.
4. LondheAM, Shah AB. Prostate Specific Antigen (PSA) Levels and its Correlation to Prostatic Lesions. Annals of Pathology and Laboratory Medicine. 2018; 5(11):A894-99.
5. Banerjee B, Iqbal BM, Kumar H, Kambale T, Bavikar R. Correlation between prostate specific antigen levels and various prostatic pathologies. J Med Soc. 2016; 30:172-175.
6. Xu W, Ming Zhou M. A concise update on prostate pathology. CeskPatol. 2014; 50(4):120-128.
7. Kiehl R, Luiz AD,Lemos LAD, Stavale JN, Ortiz V. Correlation between chronic prostatitis and prostate specific antigen values. Brazilian Journal of Urology. 2001; 27(1):42-45.
8. Vani BR, Kumar D, Sharath BN, Murthy VS, Geethamala K. A comprehensive study of prostate pathology in correlation with prostate-specific antigen levels: An Indian study. Clin Cancer Investig J. 2015; 4:617-620.
9. Patwardhan SK, Patil BP, Shelke UR, Singh AG. An overview of serum prostatic surface antigen cut points for recommendation of prostatic biopsy. Urol Ann. 2018; 10(1):65–70.
10. Yanai Y, Kosaka T, Hongo H, Kazuhiro Matsumoto K, Toshiaki Shinojima T et al. Evaluation of prostate-specific antigen density in the diagnosis of prostate cancer combined with magnetic resonance imaging before biopsy in men aged 70 years and older with elevated PSA. Mol Clin Oncol. 2018; 9(6):656–660.
11. Jayapradeep DP, Prakash VB,Pai MR. Histomorphologic correlation of PSA levels in prostatic pathology. National Journal of Laboratory Medicine. 2017; 6(4):28-32.
12. Anunobi CC, Elesha SO, Daramola AO, Tijani KH, Ojewola RW. Prostate diseases in Lagos, Nigeria: A histologic study with tPSA correlation. The Nigerian Postgraduate Medical Journal. 2011; 18(2):98-104.
13. Mittal BV, Amin MB, Kinare SG. Spectrum of histological lesions in 185 consecutive prostatic specimens. J Postgrad Med. 1989;35:157-161.
14. Chukwuemeka CN, Olalekan SK, Emmanuel KA. A histopathological study of prostate lesions in Lagos, Nigeria: A private practice experience. Niger Med J. 2015; 56(5):338–343.
15. Maru AM, Makwana HH, Lakum NR, Chokshi T, Agnihotri A, Trivedi N et al. Study on correlation between Prostate Specific Antigen (PSA) and various prostatic pathology. Int J Med Sci Public Health. 2014; 3:735-737.
16. Khant VS, Goswami H, Shah PY. Correlation of serum prostate-specific antigen level in various prostate pathology in elderly men. Int J Med Sci Public Health. 2017; 6:257-261.
17. Parthiban R, Roopa AN, Puttaswamy K, Shariff S. Efficacy of prostate-specific antigen to categorize men with prostate pathology into benign, premalignant, and malignant lesions. J of med sc&health. 2016; 02(2):1-5.
18. Yusim I, Krenawi M, Mazor E, Novack V, Mabjeesh NJ. The use of prostate specific antigen density to predict clinically significant prostate cancer Sci Rep. 2020; 10(1):20015.
19. Dada AO, Soriyan OO, Okpara H, Onyenekwu CP, Egbuagha E. Relationship between prostate specific antigen and body mass index among men in Lagos, West Nigeria. Ann Trop Pathol. 2018; 9:42-46.
20. Jyoti SK, Blacke C, Patil P, Amblihalli VP, Nicholson A. Prostate cancer screening by prostate-specific antigen (PSA); a relevant approach for the small population of the Cayman Islands.Cancer Causes Control. 2018; 29(1):87-92.

Conflict of Interest: Nil
Source of support:Nil