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Original Article

PROSTATE SPECIFIC ANTIGEN, ALKALINE PHOSPHATASE, UREA, CREATININE AND HEMOGLOBIN IN BENIGN PROSTRATIC HYPERPLASIA AND CARCINOMA PROSTATE

1. ZEHRA NAZ
2. SAADIA ANJUM

1. ***Assistant Professor,***
Biochemistry Department,
Islamic International Medical College, Rawalpindi;
2. ***Professor and Chairman***
Biochemistry Dept.,
Frontier Medical College, Abbottabad.

For correspondence:
DR. ZEHRA NAZ
M. B; B. S., M. Phil
Assistant Professor,
Biochemistry Department,
Islamic International Medical College, Rawalpindi;
E-mail: zehranaz@hotmail.com
25-A, Lane 3, Tulsa Road, Lalazar, Rawalpindi.
Cell #: +92-0333-3392924

ABSTRACT

Objective: In benign prostatic hyperplasia and carcinoma prostate not only prostate specific antigen levels are altered but the levels of other chemical parameters like alkaline phosphatase, urea, creatinine and hemoglobin are also changed. Purpose of this study was same.
Design: Case-control study.
Subjects and Methods: From the study population of 250 subjects 93 were selected, representing the normals, BPH and CaP cases. Prostate specific antigen, alkaline phosphatase, urea, creatinine and hemoglobin were estimated.
Results: Mean PSA concentration was highly significant (P=0.001) when normals were compared with BPH and CaP case. Significant differences in ALP levels were observed in normals versus CaP cases (P<0.01); BPH versus CaP cases (P=0.01). Serum urea and creatinine levels were insignificant in all the groups. Levels of hemoglobin showed highly significant differences (P=0.001) when normal were compared with CaP cases
Conclusion: PSA increases in both BPH and CaP but marked changes were seen in CaP cases but as the carcinoma further progresses changes in ALP and Hb do occur, which should be given due consideration during the management of these diseases.

Key words: BPH = Benign Prostatic Hyperplasia, CaP = Carcinoma prostate, PSA = Prostate specific antigen, ALP=Alkaline phosphatase, Hb = Hemoglobin

INTRODUCTION

Benign prostatic hyperplasia and Carcinoma prostate are the most common diseases of our male population.[1] Whenever the diagnosis of BPH and CaP is made, prostate specific antigen (PSA) levels are estimated in blood along with digital rectal examination and transrectal ultrasound is done and the diagnosis is confirmed by biopsy.
PSA being 'best tumor marker'[2] available is always measured but as it is known that with the progress of carcinoma prostate, it metastasized to different organs via blood which result in increased alkaline phosphatase (ALP) levels due to involvement of bones[3] and metastasis also produces anemia.
Thus, this study was conducted to see the effect of BPH and CaP on prostate specific antigen (PSA), alkaline phosphatase (ALP), urea, creatinine and hemoglobin (Hb)

SUBJECTS AND METHODS

For this case-control study, from the study population of 250 subjects 93 were selected, representing the normals, BPH and CaP cases, from out patients department of SIUT (Sindh Institute of Urology and Transplantation), Karachi. Duration of the study was more then six months. All subjects were of forty and above years. Those who were, taking 5-α reductase inhibitors or suffering from any other disease of urinary tract were excluded from the study. After obtaining informed consent and complete clinical exami-

nation blood samples were collected, freezed till assayed except the sample for hemoglobin which was collected in sodium citrate containing test tube and was tested immediately.

PSA was done by using total PSA assay on Abbott AxSYM system. Urea and alkaline phosphatase were estimated by kits of Randox laboratories, U.K.; creatinine estimation was done by using Roche Diagnostics, USA, kits, on Hitachi-911 analyzer. Hemoglobin was estimated on Sysmex Automatic hematology analyzer, SF-3000.

Values were expressed as mean and standard error of mean (s.e.m.), and Students t-test was applied.The data analysis was done on SSP version 10

RESULTS

Table-1 shows the mean value of prostate specific antigen (PSA), alkaline phosphatase (ALP), urea, creatinine and hemoglobin (Hb) in normal, benign prostatic hyperplasia (BPH) and carcinoma prostate (CaP) cases.

Table-2 shows the comparison of PSA, ALP, urea, creatinine and hemoglobin (Hb) in normal, BPH and CaP case.

When comparing normal with BPH cases, the concentration of PSA was found highly significant (P=0.001), concentrations of ALP, urea, creatinine and Hb were statistically non-significant. When comparing normal with CaP cases, the concentration of prostate specific antigen and Hb were highly significant (P=0.001), concentrations of ALP was significant (P<0.01) whereas concentrations of urea, creatinine were statistically non-significant. When comparing BPH with CaP cases, concentration of ALP, was significant (P=0.01), whereas the concentrations of prostate specific antigen, urea, creatinine and hemoglobin were statistically non-significant.

DISCUSSION

In this study we saw the effect of benign prostatic hyperplasia and carcinoma prostate on prostate specific antigen, alkaline phosphatase, urea, creatinine, and hemoglobin, because in carcinoma prostate cases these parameters are altered due to metastasis effecting different systems of the body.

In present study, it was found that mean PSA concentration was highly significant (P=0.001) when normals were compared with BPH and CaP cases. Bangma et al[4] data match with the present study in case of BPH cases, whereas in CaP case mean values were lower than the present study. It could be because of the age range of the study group that was from 54-77 years. Results of Roehrborn et al[5] regarding mean PSA concentration in normal and BPH cases match with this study, however their age group for BPH cases included subjects with 40-70 years, whereas that of normals was from 30-49 years. In the study of Carter et al[6] values in CaP cases were lower than this study. It might be because of their selection of patients with curable cancer and with non-palpable disease. Results of Stamey et al[7], Collins[8], DeAntoni[9], Oesterling et al[10], Recker et al[11], Cooney et al[12,] Tanguay et al[13], and Fukatso et al[14] for PSA level were comparable with present study.

Alkaline phosphatase is a chemical parameter that is characteristically increased when there is metastasis in the bone, as it is an indicator of osteoblastic activity.[3] ALP levels showed significant differences when comparisons were made between normals and CaP cases (P<0.01), and BPH and CaP cases (P=0.01). Casetta et al[15] noted a vast difference in alkaline phosphatase levels between normals and CaP cases, a finding that is similar to present study. de L Pierda et al[16] considered BPH and CaP cases, they found significantly higher values for ALP in CaP cases, which was similar to present study in case of CaP group only. We failed to find any contradictory study.

Two parameters urea and creatinine were performed to rule out the urinary obstruction cases due to causes other than BPH and CaP, as they are not meant for the diagnosis or prognosis of these diseases. Serum urea and creatinine levels in this study showed insignificant differences when all the groups were compared. It has been found that serum creatinine level rises in chronic renal failure[17] and the progress of renal disease is better correlated with serum levels of urea along with creatinine.[18] Gerber et al[19] found the serum creatinine levels for normal cases, comparable to present study. He considered serum creatinine measured in men with urinary tract symptoms secondary to BPH.

TABLE-1

CHEMICAL PARAMETERS IN NORMAL, BENIGN PROSTATIC HYPERPLASIA AND CARCINOMA PROSTATE CASES

(The values are expressed as mean ± standard error of mean)

Parameters	Normal (n=31) Mean ± s.e.m.	BPH (n=31) Mean ± s.e.m.	CaP (n=31) Mean ± s.e.m.
PSA (ng/mL)	0.75 ± 0.10	4.61 ±1 .04	148.39 ± 39.89
Alkaline phosphatase (U/L)	82.35 ± 4.9	87.90 ± 10.25	208.45 ± 41.29
Urea (mg/dl)	32.58 ± 2.02	34.35 ± 2.35	36.74 ± 2.92
Creatinine (mg/dl)	1.08 ± 0.06	1.30 ± 0.15	1.46 ± 0.30
Hemoglobin (gm/dl)	13.64 ± 0.25	12.89 ± 0.35	11.92 ± 0.41

Key:
BPH = Benign prostatic hyperplasia
CaP = Carcinoma prostate
PSA = Prostate specific antigen

TABLE-2

COMPARISON OF CHEMICAL PARAMETERS IN NORMAL, BENIGN PROSTATIC HYPERPLASIA AND CARCINOMA PROSTATE CASES

Parameters	Normal vs. BPH			Normal vs. Ca			PBPH vs. CaP		
	t	df	P	t	df	P	t	df	P
PSA (ng/mL)	3.70	60	0.001****	3.70	60	0.001****	0.88	60	0.39*
Alkaline phosphatase (U/L)	0.49	60	0.63*	3.03	60	<0.01***	2.83	60	0.01***
Urea (mg/dl)	0.57	60	0.57*	1.71	60	0.25*	0.64	60	0.53*
Creatinine (mg/dl)	1.37	60	0.18	1.26	60	0.21*	0.47	60	0.64*
Hemoglobin (gm/dl)	0.74	60	0.09*	3.56	60	0.001****	1.80	60	0.08*

*Non-significant
**P<0.05, ***P<0.01, ****P<0.001

Key:
BPH = Benign prostatic hyperplasia
CaP = Carcinoma prostate
PSA = Prostate specific antigen

Levels of hemoglobin in this study showed highly significant differences (P=0.001) when normal cases were compared with CaP cases. Tauheed[20] found hemoglobin levels in smokers, ischemic heart disease patients and hypertensives. Only the normal group of his study was considered which matched with the results of present study. It has been suggested that anemia in cancer may be secondary to blood loss, displacement of normal bone marrow cells by malignant cells, myelotoxic therapy or the tumor itself. [21]

CONCLUSION

It was concluded from the present study that PSA increases in both BPH and CaP but marked changes are seen in CaP cases, moreover, due to the progress of carcinoma changes in ALP and Hb do occur as a result of metastasis, therefore, while managing these diseases the conditions associated with them (e.g. anemia) must be treated too, so that the patients health stability can be maintained.

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REFERENCES:

1. Zahir N, Mubarik A, Abdullah P, Mehmood A, Zahur-ur-rehman. Pattern of malignant tumors in Karachi, is it different? J Coll Phys Surg Pak 2000; 10: 338-41.
2. Vollmer RT, Dawson NA and Vogelzang NJ. The dynamics of prostate specific antigen in hormone refractory prostate carcinoma. An analysis of cancer and leukemia group-B study 9181 of Megestrol acetate. Cancer 1998; 83: 1989-94.
3. Cooper EH, Robinson MRG, Whelan P and Ferro Ma. Tumor markers in prostate cancer. Cancer 1992; 70: S1, 225-29.
4. Bangma CH, Kranse R, Blijenberg BG and Schroder FH. Free and total prostate specific antigen in a screened population. Br J Urol 1997; 79: 756-62.
5. Roehrborn CG, Boyle P, Gould AL and Waldstreicher J. Serum prostate specific antigen as a predictor of prostate volume in men with benign prostatic hyperplasia. Urology 1999; 53: 581-9.
6. Carter HB, Epstein JI and Partin AW. Influence of age and prostate specific antigen on the chance of curable prostate cancer among men with non-palpable disease. Urology 1999; 53: 126-30.
7. Stamey TA, Yang N, Hay AR, McNeal JE, Freiha FS and Redwine E. Prostate specific antigen as a serum marker for adenocarcinoma of the prostate. N Engl J Med 1987; 317: 909-16.
8. Collins GN, Lee RJ, McKllvie GB, Rogers CAN and Hehir M. relationship between prostate specific antigen, prostate volume and age in the benign prostate. J Urol 1993; 71: 445-50.
9. DeAntoni EP, Crawford ED, Oesterling JE, Ross CA, Berger ER, McLeod DG, Staggers F and Stone NN. Age and race specific reference ranges for prostate specific antigen from a large community based study. Urology 1996; 48: 234-39.
10. Oesterling JE, Jacobsen SJ, Klee GG, PettersonK, Piironen T, Abrahamsson PA, Stenman UH, Dowell B, Lövgren T and Lilja H. free, complexed and total serum prostate specific antigen: the establishment of appropriate reference ranges for their concentrations and ratios. J Urol 1996; 154: 1090-95.
11. Recker F, Kwaitkowski MK, Piironen T, Pettrson K, Lummen G, Wernli M, Wiefelspútz J, Graber SF, Goepel M, Huber A and Tscholl R. The importance of human glandular kallikrein and its correlation with different prostate specific antigen serum forms in the detection of prostate

carcinoma. Cancer 1998; 83: 2540-7.
12. Cooney KA, Strawderman MS, Wonjo KJ, Doerr KM, Taylor A, Alcser KH, Heeringa SG, Taylor JMG, Wei JT, Montie JE and Schottenfeld D. Age-specific distribution of serum prostate-specific antigen in a community based study of African-American men. Urology 2001; 57: 91-6.
13. Tanguay S, Bégin LR, Elhilali MM, Behlouli H, Karakiewicz PI and Aprikian AG. Comparative evaluation of total PSA, free/total PSA and complexed PSA in prostate cancer detection. Urology 2002; 59: 261-65.
14. Fakutsu A, Ono Y, Ito M, Yoshino Y, Hattori R, Gotoh M and Ohshima S. Relationship between serum prostate specific antigen and calculated epithelial volume. Urology 2003; 61: 370-74.
15. Casetta G, Gamba P, Piana P, Pecchio F and Tuizzani A. Measurement of skeletal alkaline phosphatase in prostatic carcinoma. Preliminary report. Minerva Urol Nefrol 1995; 47: 9-12.
16. de L Pierda C, Castro-erecaborde NA, Traba ML, Mendez-Davila C, Garcia-Moreno C, Rodriguez, de Acuna L and Rodriguez-Molina J. Bone remodeling markers in the detection of bone metastasis in prostate cancer. Clin Chem Acta 2003; 331: 45-53.
17. Ralph G. Creatinine excretion in renal failure. Proc Soc Exp Biol Med 1954; 85: 446-48.
18. Dossettor JB. Creatininemia versus uremia. The relative significance of blood urea nitrogen and serum creatinine concentrations in azotemia. Am Intern Med 1966; 65: 1287-99.
19. Gerber GS, Goldfischer ER, Karrison TG and Bales GT. Serum creatinine measurements in men with lower urinary tract symptoms secondary to benign prostatic hyperplasia. Urology 1997; 49: 697-702.
20. Tauheed S. Hemoglobin, hematocrit, fibrinogen and relative viscosity of plasma in smokers and in patients of ischemic heart disease and hypertension. M. Phil Thesis 1990: p 38.
21. Gillespie TW. Anemia in cancer: therapeutic implications and interventions. Cancer Nurs 2003; 26: 119-29; quiz 129-30.

Author's contribution:

Dr.Zehra Naz: The researcher of the study; who has conducted the study, written the manuscript, and interpreted the results.

Dr. Saadia Anjum: Supervisor.

Conflict's of interest:
None.

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Ethics:
Verbal consent was taken from the subjects prior to the conduction of study.