

Serum Zinc & Acid Phosphatase Levels & Its Correlation in Patients of Benign & Malignant Prostatic Disease

* Sumayya Qazi, Yar Muhammad Nizammani, Samia Siddiqui, Mumtaz Qureshi,
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 Arsalan Ahmed Uqaili, Sikandar-e-Azam

ABSTRACT

Objective: To determine the serum Zinc level in patients with benign prostatic hyperplasia (BPH) and prostatic carcinoma and its correlation with serum acid phosphatase.

Methods: This was a case control study conducted in the Urology and General Surgery departments Isra University Hyderabad, during April 2016 to Nov: 2016. Total 100 male were studied, 25 patients with diagnosis of BPH and 25 diagnosed cases of prostatic carcinoma, while 50 normal cases were selected as a control. Blood samples were taken from all the patients and analyzed in the diagnostic and research laboratories of Isra University and LUMHS Hyderabad for serum zinc and serum acid phosphatase levels. All the clinical and demographic data was recorded on a proforma and statistically analyzed.

Results: Mean serum acid phosphate levels were significantly raised in patients presented with BPH and prostate carcinoma as compare to normal study population p-value 0.0001. Though mean of serum acid phosphate level in patients with BPH was 16.03 ± 5.89 U/L and 46.43 ± 6.22 U/L in patients presented with prostate carcinoma while 2.28 ± 0.99 U/L was in normal cases. Serum zinc was significantly decreased in patients having BPH and prostate cancer P-value 0.001. Weak correlation was found between Prostate acid phosphate level and serum zinc level in normal cases r-value = 0.001. Negative correlation was found between Prostate acid phosphate level and serum zinc level in patients presented with BPH and prostate carcinoma r-value = 0.071.

Conclusion: It is concluded that prostatic acid phosphatase was significantly raised and serum Zinc levels significantly decreased in patients with BPH and carcinoma of prostate gland as compare to normal cases. Prostate acid phosphatase level and serum zinc level were negatively correlated between them.

Key Words: BPH, Prostatic Carcinoma, Acid Phosphatase, Zinc.

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INTRODUCTION:

Among different accessory glands of male reproductive systems, the Prostate gland is one of them, which adds secretions to semen. Prostate

gland disorders are among prevalent urinary disorders of senility. Prostate gland is affected by a number of disorders such as infections, benign hypertrophy and malignant disorders. Benign prostatic hypertrophy (BPH) is most often encountered problem of urinary tract in old age. While its malignancy is a serious health problem of old age. Prostate gland cancer is reportedly the 6th most common type of cancer throughout the World^{1,2}. Genetic factors, environmental hazards and factors related to diet have been implicated as its aetiopathogenesis. Alcohol consumption, smoking, pollutants, hormones and sexually transmitted diseases are important environmental risk factors for prostate

* Assistant Professor, Deptt. of Biochemistry, FM&AMS, Isra University, Hyderabad.
 ** Assistant Professor, Deptt. of Physiology, FM&AMS, Isra University, Hyderabad.
 *** Associate Professor, Deptt. of Physiology, FM&AMS, Isra University, Hyderabad.
 **** Professor, Deptt. of Biochemistry, FM&AMS, Isra University, Hyderabad.
 ***** Associate Professor, Surgical-II, PUMHSW SBA

Correspondence to:

Dr. Sumayya Qazi

Assistant Professor, Deptt. of Biochemistry,
 FM&AMS, Isra University Hyderabad.
 Email: drsumayyakazi@gmail.com

malignancy. Consumption of large quantities of fats, certain vitamin deficiency, trace elements and other micronutrients are suggested as dietary risk factors. All of these factors as mentioned are involve in the aetiopathogenesis of prostate gland cancer. These factors directly or indirectly interact with genes in causing abnormal glandular growth³. Carcinogenic agents of unknown origin may be present in diets, for example the heavy metals and also the endogenous hormones, both of which may induce carcinogenesis³. Some of the heavy metals are essential for cellular functions while others are toxic and may be carcinogenic for human beings⁴. Various studies conducted on trace elements had suggested a possible role of heavy metals in the carcinogenesis. Heavy metals are suggested to interfere at the level of biochemical and metabolic enzyme levels of a cell. Extremes of heavy metal concentrations may be playing a role in carcinogenesis. However, a precise role of heavy metals in the initiation and promotion of cancer remains to be elucidated^{5,6}. For better understanding, it is essential to identify the probability of heavy metals and its association with cancer of prostate gland. An alteration in the homeostasis of trace elements in common prostate gland disorders is worth to explore. Both of BPH and Prostate cancer have different histopathological characteristics, biological behavior and clinical findings with different metabolic alterations need to be evaluated. A change in serum concentrations of certain heavy metals/trace elements has been reported in previous studies^{4,7} and needs further understanding. Previous studies had also reported low levels of zinc have been implicated carcinogenesis of prostate cancer. However other studies reported contrary results⁸. Thus, the role of heavy metals/trace elements remains an uncertainly, whether deficiency or excess is a risk factor for pathogenesis of BPH and Prostate cancer. Therefore, a research gap remains there to probe into the possible association and etiological role of heavy metals/trace elements; the copper and zinc in benign and malignant prostate disease which needs further elucidation. Therefore present study is proposed to evaluate the serum

zinc level in benign prostatic hypertrophy and prostate cancer and their correlation with acid phosphatase in patients presenting at tertiary care hospital of Isra University.”

METHODS:

This case control study was conducted after approval of ethical committee of Isra university Hospital, Hyderabad. Study was conducted at Urology and General Surgery departments of Isra University Hyderabad, from April 2016 to November 2016. Total 100 male cases were selected and divided into three groups. Group A consists of 50 normal cases, selected as a control. Group B consists of 25 diagnosed cases of BPH, and group C have 25 diagnosed cases of carcinoma of prostate.

All the patients those presented with diabetes, elevated blood urea and serum creatinine levels, lipid profile abnormalities and patients having anaemia and hypo-proteinemia were excluded from study. Blood samples were taken from all the patients and were send to the diagnostic and research laboratories of Isra University and LUMHS Hyderabad to assess the serum zinc and serum acid phosphatase levels. “Data was analyzed on SPSS version 22.0 by using student t-test and A nova test” to compare the mean of quantitative variables. Pearson correlation was applied to see the association between zinc and acid phosphate levels.

RESULTS;

Total 100 cases were studied and divided in three groups, mean age of controls was 61.39 ± 5.88 years, mean age of patients with BPH was 61.39 ± 5.88 years and mean age of patients having prostate carcinoma was 61.44 ± 5.27 years. There was no significant difference in the mean age of study groups ($p = 0.068$) (Table-I).

In this study mean of serum acid phosphate level was significantly raised in patients presented with BPH and prostate carcinoma as compare to normal study population p -value 0.0001. Though mean of serum acid phosphate level in patients with BPH was 16.03 ± 5.89 U/L and mean serum acid phosphate level in patients presented with prostate carcinoma was 46.43 ± 6.22 U/L while

it was very low in normal cases as 2.28 ± 0.99 U/L respectively (Table-II).

In this study serum zinc was significantly decreased in patients having BPH and prostate cancer P-value 0.001. Though it was noted as 85.10 ± 26.53 $\mu\text{g/dl}$ in normal cases, 74.64 ± 20.89 $\mu\text{g/dl}$ was in patients having BPH and 63.76 ± 15.42 $\mu\text{g/dl}$ was found in patients presented with prostate carcinoma (Table-III).

In this study weak correlation was found between Prostate acid phosphate level & serum zinc level in normal cases r-value = 0.001 (graph-I).

In our study a strong negative correlation between Prostate acid phosphate level and serum zinc level in patients presented with BPH and prostate carcinoma r-value = 0.071 (graph-II).

Table-I: Age Distribution of Controls & Cases (n=100)

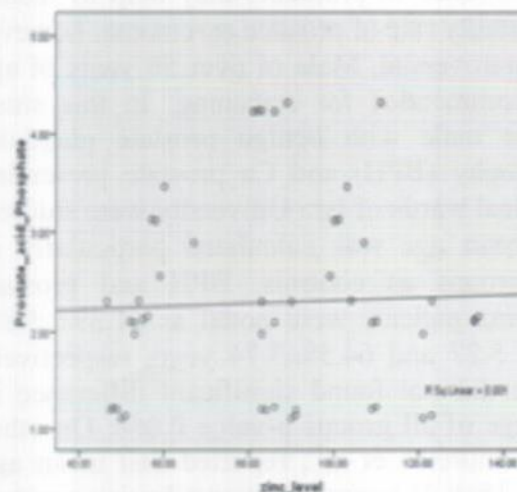
Groups	Mean	SD	F Value	P Value
Group A. Controls	61.39	5.88	13.37	0.068
Group B. BPH	61.44	5.27		
Group C. Prostate cancer	64.58	3.747		

Table-II: Serum Acid Phosphatase Levels (U/L) in Controls & Cases (n=100)

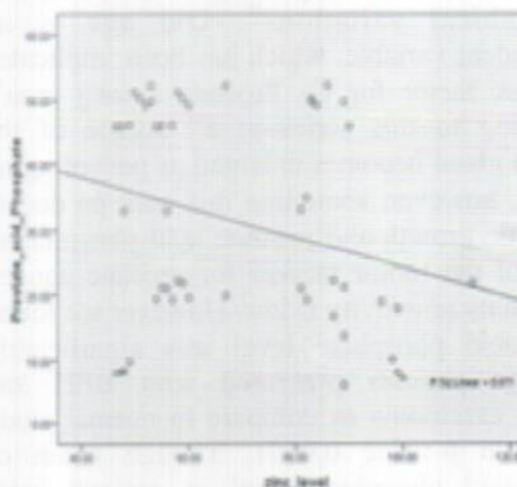
Groups	Mean	SD	F Value	P Value
Group A. Controls	2.28	0.99	869.6	0.0001
Group B. BPH	16.03	5.89		
Group C. Prostate cancer	46.43	6.22		

Table-III: Serum Zinc Levels ($\mu\text{g/dl}$) in Controls & Cases (n=100)

Groups	Mean	SD	F Value	P Value
Group A. Controls	85.10	26.53	7.46	0.0001
Group B. BPH	76.64	20.89		
Group C. Prostate cancer	63.76	15.42		



Graph:I. Scattered chart showing weak correlation between Prostate acid phosphate level and serum zinc level in normal cases r-value = 0.001



Graph:II. Scattered chart showing negative correlation between Prostate acid phosphate level and serum zinc level in patients presented with BPH and prostate carcinoma r-value=0.071

DISCUSSION:

The present study was conducted to evaluate the serum copper and prostate acid phosphatase (PAP) levels in normal controls (group A), and cases of benign prostatic hypertrophy (BPH) (group B) and carcinoma prostate (Ca Prostate) (group C). Ca prostate is the second most common cause of cancer related mortality in the developed countries⁹ Strict screening programs

and adherence to protocols may help to reduce the mortality rate of prostate carcinoma; however it is controversial. Male of over 50 years of age are recommended for screening. In this study old age male with benign prostate glandular hypertrophy (BPH) and Ca prostate presenting at surgical wards of Isra University were studied, their mean age was calculated particularly in three groups as controls, BPH and prostate carcinoma patients were noted as 61.39 ± 5.88 , 61.44 ± 5.27 and 64.58 ± 3.74 years respectively and we did not found significant difference in mean age of all groups p-value 0.068. On other hand Famurewa et al¹⁰, reported that mean age was 71.35 ± 8.45 years of patients having prostate carcinoma which is slightly higher than the findings present study, while consistently Famurewa et al¹⁰ reported that there was no significant difference in age of controls and patients $P < 0.05$, but age may differ due to geographical variations¹⁰. Old age is an independent variable, which has been implicated as a risk factor for Ca Prostate among men¹¹. According to this series at 5th decade of the prostate gland becomes enlarged as part of aging process, however, sometime this may be due to neoplastic growth and prostate acid phosphatase is one of the tumor marker for prostate cancer, although its sensitivity is low. However we found serum acid phosphate level was significantly raised in patients presented with BPH and prostate carcinoma as compare to normal study population p-value 0.0001. Though mean of serum acid phosphate level in patients with BPH was 16.03 ± 5.89 U/L and mean serum acid phosphate level in patients presented with prostate carcinoma was 46.43 ± 6.22 U/L while it was very low in normal cases as 2.28 ± 0.99 U/L. The findings of prostate acid phosphatase of present study for prostate cancer are in confirmation of the study Gabra et al¹² in which it is reported that elevated prostate acid phosphatase 45.43 ± 3.2 U/L was in cases presented with prostate cancer. As regards in this study serum zinc was significantly decreased in patients having BPH and prostate cancer P-value 0.001. Though it was noted as 85.10 ± 26.53 $\mu\text{g/dl}$ in normal cases, 74.64 ± 20.89 $\mu\text{g/dl}$ was in

patients having BPH and 63.76 ± 15.42 $\mu\text{g/L}$ was found in patients presented with prostate carcinoma. Our findings regarding of low zinc level are consistently in agreement to previously published studies by Karimi et al¹³, Tiwari et al¹⁴, and Chistudous et al.¹⁵ Our these findings are also consistent to recently reported study of Singh et al (2015) in which it is stated that lower serum zinc level is associated with prostate cancer. In a previously publish study reported that the zinc may be taken as biomarker for the prostate cancer⁹, and findings of this previous study are correlated our observation. Chirstudoss, et al¹⁵, also found comparable results. Our findings are highly comparable as present study observed $P \leq$ value of 0.065, 0.0001 and 0.031 between controls, BPH and Ca prostate patients respectively. Consistently low zinc in prostate carcinoma is also a consistent finding to previous study of Karimi et al. However, the Karimi et al estimated zinc from the nails and hair of prostate glands ($p < 0.05$) while present study estimated serum zinc levels. Low zinc finding is a consistent and comparable finding to Karimi et al¹³. In the favor of this study many previous studies had reported that increased incidence of prostate cancer associated with zinc deficiency¹⁶⁻¹⁸.

However in this series prostate acid phosphatase showed a negative correlation with serum zinc level and it is observed that low serum zinc in benign prostatic hypertrophy and carcinoma of prostate. Further studies will help to clarify whether, along with clinical diagnosis, the serum zinc is useful in the differential diagnosis of BPH and Ca prostate^{19,20}. Consideration of the biochemical evidence presented here ensures to the conclusion that altered serum zinc metabolism may be playing a causal role in the benign prostate hypertrophy and prostate cancer. This may be because that prostatic fluid contain high concentration of zinc in, and zinc also known as the antibacterial factor. Continuing release of the zinc through prostate may play an important role in prevention of UTI and prostate diseases¹⁸.

CONCLUSION:

It is concluded that prostatic acid phosphatase was significantly raised and serum Zinc

levels significantly decreased in patients with BPH and carcinoma of prostate gland as compare to normal cases. Negative correlation was between Prostate acid phosphatase level and serum zinc level. Though, prostatic acid phosphatase and serum Zinc concentrations are good bio-markers in patients having BPH and carcinoma of prostate, these both may use as screening diagnosis of BPH.

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