Implications of serum urea and creatinine estimation in prostate cancer

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Abstract
Demographic and epidemiological transitions in developing countries like India have shown an increasing trend in burden of non communicable diseases like cardiovascular disease, diabetes as well as cancer. Previously, it was thought that the prevalence of prostate cancer in India is far lower as compared to the western countries but due to various reasons it is becoming clear that we are not very far behind the rate from western countries. Since prostate disorders have an association with end stage renal disease and is also age related, this study focuses on the utility of blood levels of urea, creatinine, as a possible aid in the diagnosis of prostate cancer. The study was conducted in the Department of Biochemistry in collaboration with the Department of Surgery in MM Institute of Medical Sciences and Research, Mullana, Ambala, Haryana. The clinical and laboratory findings of 100 subjects (age $\geq$ 30 years) with biopsy-confirmed prostate related disorders as BPH, carcinoma of prostate, prostatomegaly were taken from hospital records dated January 2013 to September 2014. Out of 100 subjects, 7 (7%) had elevated serum urea, 17 (17%) had elevated serum creatinine and 7 (7%) had elevated levels of both. 29 (29%) patients had elevated serum PSA levels out of which 2 (6.8%) had elevated serum urea, 9 (31%) had elevated serum creatinine, and 2 (6.8%) had elevated serum levels of both. Majority of subjects were in the age group of 61-70 years whereas serum PSA levels were highest in the age group of 71-80 years. Therefore, increased serum urea and/or creatinine could be an early hint towards prostate cancer and it is recommended that males $\geq$40 years of age should undergo screening for serum PSA levels every 5 years.
Keywords: Prostate cancer, prostate specific antigen, urea, creatinine, serum.

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Access this article online	
Quick Response Code:	Website: www.statperson.com
	Volume 10 Issue 1

INTRODUCTION

Globally, prostate cancer is the second most frequently diagnosed cancer in men (13.6% of total) and the fifth most common cancer overall. It is the sixth leading cause of cancer death in men (6.1% of total). Case fatality rate in low income countries (78.6%) is 3.5 times that of high income countries (22.5%)[1]. Prostate cancer is primarily a disease of the elderly men with three quarter of cases occurring in men aged 65 years and above. It has become a major health problem in industrialized world during the last decades of the 20th century contributing to three fourth of the registered cases across the globe. Incidence rates of prostate cancer vary by more than 25 fold worldwide, the highest rates being in Australia/New Zealand (104.2/100,000), Western and Northern Europe, North America, largely because the practice of prostate specific antigen (PSA) estimation has become widespread in those regions. Incidence is relatively high in certain developing regions too, such as the Caribbean, Sub Saharan African countries. Incidence rates are low in Asian and North African countries, ranging from 1-9/100,000 persons[2]. Demographic and epidemiological transitions in developing countries like India have shown an increasing trend in burden of non communicable diseases like cardiovascular disease, diabetes as well as cancer[3]. Previously, it was thought that the prevalence of prostate cancer in India is far lower as compared to the western countries but due to various reasons (Table1) it is coming to the knowledge that we are not very far behind the rate from western countries[4].

Table 1: Reasons for increasing prevalence of cancer prostate in India

Increased migration of rural population to the urban areas
Changing life styles
Improved longevity
Increased awareness
Increased affordability

Conventionally used laboratory markers for the diagnosis of prostate disorders are acid phosphatase and PSA, a glycoprotein produced in the benign and malignant prostate cells. However, the latter has replaced the former with regard to sensitivity and specificity. It was earlier reported that serum creatinine is associated with a high risk of prostate cancer, more so in advanced cases where the chances of survival were low[5]. Some of the biochemical parameters that were reported to be useful in the diagnosis of prostate cancer include free PSA to total PSA ratio[6,7] and serum to urinary PSA ratio[8]. It is evident in the current scenario, that there is a dearth of biochemical parameters for differential diagnosis of prostate disorders, paving way for the identification of newer ones. Since prostate disorders have an association with end stage renal disease and is also age related[9], this study focuses on the utility of blood levels of urea, creatinine, as a possible aid in the diagnosis of prostate disorders including cancer.

MATERIALS AND METHODS

The study was conducted in the Department of Biochemistry in collaboration with the Department of Surgery in MM Institute of Medical Sciences and Research, Mullana, Ambala, Haryana. The clinical and laboratory findings of 100 subjects (age ≥ 30 years) with biopsy-confirmed prostate related disorders as BPH, carcinoma of prostate, prostatomegaly were taken from hospital records dated January 2013 to September 2014. The study was approved by Institutional Ethics Committee. Patients with acute urinary tract infection, smokers, alcoholics, diabetics and kidney disorders were excluded. In all subjects, serum PSA, urea and creatinine had been estimated by CLIA[10], enzymatic method and modified Jaffe's method[11] respectively. The reference range was: serum PSA ≤4 ng/ml, serum urea 10-45 mg/dl and serum creatinine 0.7-1.4 mg/dl respectively.

RESULTS AND DISCUSSION

Table 2: Serum urea, creatinine and PSA in study subjects

Parameter	Mean	Standard Deviation	Range
Serum urea (mg/dl)	36.45	±4.56	29-46.22
Serum creatinine (mg/dl)	1.17	±0.35	0.8-2.45
Serum PSA (ng/ml)	10.79	±20.78	0.1-84

The serum urea, creatinine and PSA value of study subjects is shown in Table 2. Out of 100 subjects, 7 (7%) had elevated serum urea (Figure 1), 17 (17%) had elevated serum creatinine (Figure 2) and 7 (7%) had elevated levels of both (Figure 3). 29 (29%) (Figure 4) patients had elevated serum PSA levels out of which 2 (6.8%) had elevated serum urea, 9 (31%) had elevated serum creatinine, and 2 (6.8%) had elevated serum levels of both. The distribution of subjects with respect to serum PSA and age is shown in Figure 5 (number of subjects and serum PSA are depicted in primary axis and secondary axis respectively). Majority of subjects were in the age group of 61-70 years whereas serum PSA levels were highest in the age group of 71-80 years. It has been reported that there is a strong correlation between prostate volume and PSA levels and therefore acute urinary retention[12]. Elevated levels of urea and creatinine may also be due to the drugs used in the treatment of cancer prostate.
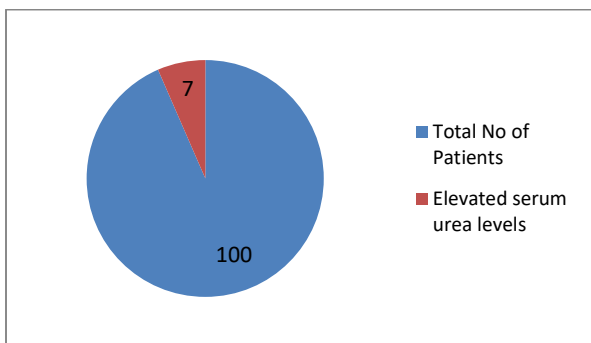

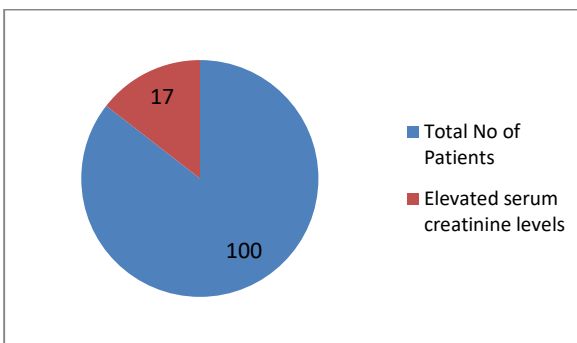**Figure 1:** Subjects with elevated serum urea levels

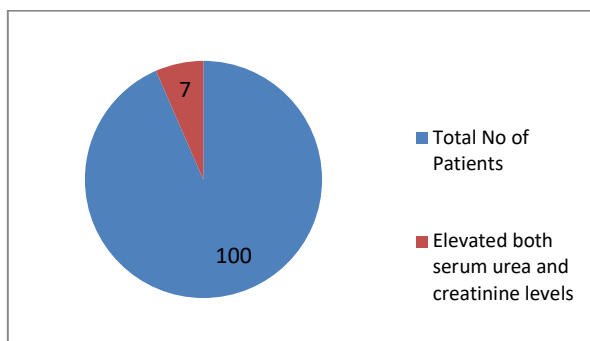**Figure 2:** Subjects with elevated serum creatinine levels

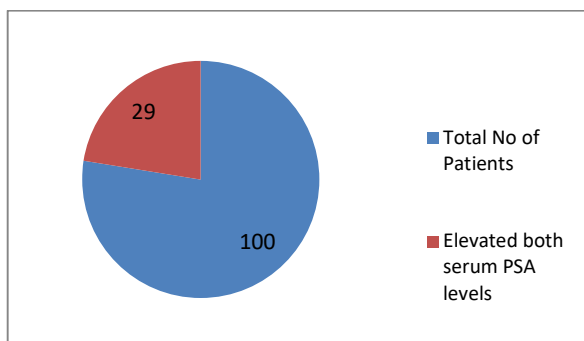**Figure 3:** Subjects with both elevated serum urea and creatinine levels

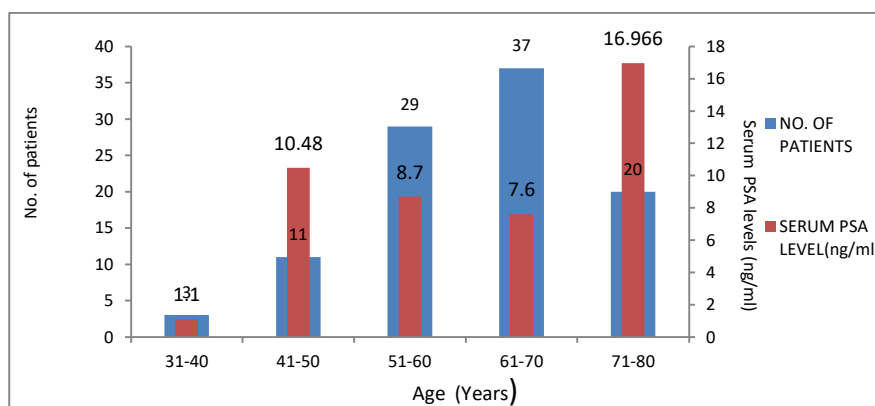**Figure 4:** Subjects with elevated serum PSA levels

Figure 5: Distribution of subjects with respect to serum PSA and age

CONCLUSION

Increased serum urea and/or creatinine could be an early hint towards prostate cancer. Males ≥40 years of age should undergo screening for serum PSA levels every 5 years.

ACKNOWLEDGEMENTS

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