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Original Article

Evaluation of prostate specific antigen level in different age group of Patients in Eastern part of Nepal

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Abstract

Background

A study was conducted to evaluate Prostate specific antigen (PSA) level in different age group of patients in Nobel Medical College Teaching Hospital (NMCTH), Biratnagar, Eastern Nepal.

Material and Methods

A total of 1870 male patients (age 51-88), attending OPD in different departments of NMCTH, were sent to Clinical Laboratory Services for estimation of Prostate specific antigen from 1st January 2013 to 30thJune 2014 and recruited for this study after Institutional ethical approval.

Blood serum of these patients was tested for Prostate specific antigen level by Chemiluminescence Immunoassay (CLIA). Mean value and standard deviation were calculated using Student's two–tailed t–test. Analysis of data was performed using one–way ANOVA. Results are considered statistically significant if $p \leq 0.05$.

Results

Out of 1870 patients, 178 patients showed significantly higher level of PSA in their serum when compared to normal individuals. Out of this 178, 37 were from age group of 51-60, 51 were from age group of 61-70, 42 were from age group of 71-80 and 48 were from age group of 81-88. The remaining 1692 patients were having PSA within normal limit. PSA was found to be elevated up to a maximum of 34.5 ng/ml in patient. PSA level of <4 ng/ml was considered normal for this study.

Conclusion

This study, thus determines the diagnostic level of PSA, in different age group of patients comparing with normal individuals in eastern Part of Nepal that can help in diagnosis, prognosis and management of prostate cancer.

Key words: *CLIA, Eastern Nepal, Prostate cancer, PSA*

Introduction

The prostate specific Antigen (PSA) has been widely used to screen men for prostate cancer and it is the most common cancers afflicting men today. PSA level has got prognostic value too in diagnosed patients. PSA is accurate and precise noninvasive biomarker and its diagnostic significance is well documented. One of the most common causes of death in men is Prostate cancer and it is the second most common cancer worldwide in males. Several factors like older age, ethnicity, family history and genetic and

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environmental factors are the causes of the disease [1,2]. A serine protease enzyme, i. e. PSA having the mol. weight 33 kDa, is a set marker for screening, diagnosis and management of prostate cancer [3,4].

In Asian countries, the incidence of Prostate cancer (PCa) has been increasing in recent years, but until date it is still much lower than in Western countries.

PSA testing has been widely used for more than two decades to detect early PCa. However, its specificity is low, especially in the PSA "grayzone" (PSA 2.5–10.0 ng/ml) [5], while the mortality of PCa has greatly declined in many developed countries, it is increasing in less developed regions worldwide during the recent decade [6]. Genetic susceptibility has been indicated as a vital risk factor for PCa.

Techniques like transrectal ultrasound, biopsies, serum PSA and digital rectal examination are the tools used for early detection. The most reliable techinuqe is PSA. In other conditions such as benign prostate hyperplasia and prostatitis, PSA can also be elevated.

In this present study, an attempt is made to screen suspected cases of PCa among people in the eastern part of Nepal by collecting those who are coming to the NMCTH OPD for a duration of one and half year by using PSA as marker. We have given the data of normal as well as elevated value of Prostate specific antigen (PSA) in different age group of patients.

Material and Methods

It is a hospital based study carried out in the Department of Biochemistry of the Nobel Medical College Teaching Hospital, Biratnagar, Nepal from 1st January 2013 to 30thJune 2014 and recruited for this study after Institutional ethical approval.

A total of 1870 patients (age 51-88) from various department of NMCTH OPD were sent to Clinical Laboratory Services for estimation of PSA level. Blood Serum from these patients was tested for PSA level by Chemiluminescence Immunoassay (CLIA). The standard procedure was followed as per manufacturer's instructions for CLIA (Aculite). Approval for the study was obtained from the institutional research committee and informed consent from the patients.

Inclusion criteria for the study

The male patients of age above 50 years have been included for this study.

Exclusion criteria for the study

The male patients of age less than 50 years have been excluded for this study.

Statistical Analysis

The data on PSA levels were analyzed using nonparametric kruskal–walli's one-way analysis of variance by ranks. Mean value and standard deviation were calculated using Student's two–tailed t–test. Analysis of data was performed using a student T–test or one–way ANOVA. Results are considered statistically significant if $p \leq 0.05$.

Results

Out of 1870 patients, age range of 51 years and 88 years, screened for PSA level by CLIA, 37 patients from age group of 51-60, 51 patients from age group of 61-70, 42 patients from age group of 71-80 and 48 patients from age group of81-88 had significantly higher level of PSA and 1692 patients were having PSA within normal limit.

The PSA level was significantly elevated in all age group of patients of this study as compared to PSA range within normal limit [$p = 0.001$ for age group of 81-88, $p = 0.005$ for age group of 71-80, $p = 0.02$ for age group of 61-70, $p = 0.01$ for age group of 51-60, shown in Fig. 1].

From among the patients of 51-60 year age group, 37 patients had elevated level of PSA in which the highest and the lowest level of PSA of this group were 22.4ng/ml and 8.6 ng/ml respectively.

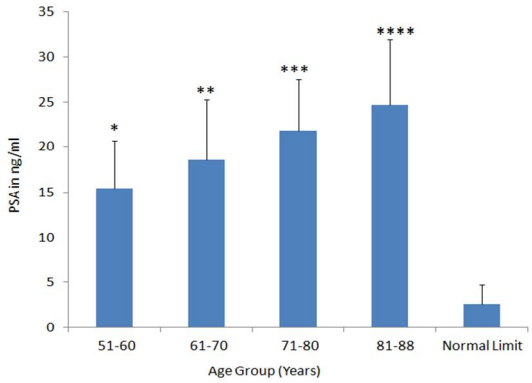

Figure 1. The elevated mean PSA level in different age group of patients

*PSA was estimated in the blood samples of patients of different age group by CLIA. Each bar represents Mean ± SD of the elevated PSA level of different patients in respective age groups. Statistical significance was compared with Normal limit by student t test. ****p =0.001; ***p = 0.005, **p =0.02, *p =0.01. [The data of 37 patients in (51-60), 51 patients in (61-70), 42 patients in (71-80) and 48 patients in (81-88) age group is shown as Mean ± SD].*

51 patients of 61-70 year age group were having very high level of PSA, the highest and lowest PSA level of this group were 28.7ng/ml and 11.1ng/ml respectively. 42 patients of the age group of 71-80 years were also having very high level of PSA, the highest and lowest PSA level of this group were 31.2ng/ml and 16.4 ng/ml respectively. Similarly, 48 patients had elevated level of PSA in the age group of 81-88 years, in which the highest and lowest PSA level of this group were 34.5 ng/ml and 15.2ng/ml respectively as shown in Fig.2.

The elevated mean value of PSA level of the patients in the age group of 51-60 years showed15.4 ± 5.3 ng/ml, whereas the elevated mean PSA level of the patients in the 61-70 year age group showed 18.5 ± 6.8 ng/ml. The age group of 71-80 & 81-88 years had 21.8 ± 5.0 ng/ml and 24.7 ± 7.2 ng/ml as the elevated mean PSA level respectively.

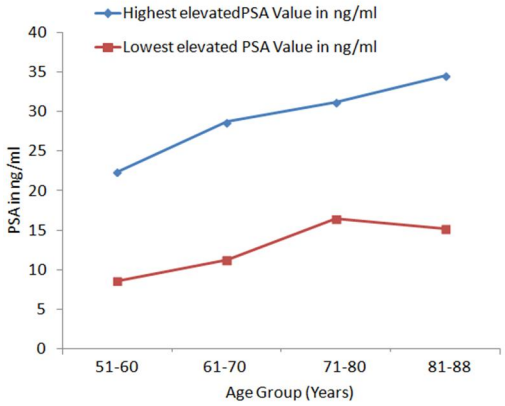

Figure 2. The highest and lowest PSA level in different group of patients

Blood samples of patients of different age group were tested for PSA level. The highest and lowest PSA level in all age group of patients, who showed elevated level of PSA.

The age group of 81-88 had more elevated mean PSA than the other age group as shown in Fig.1. The mean PSA of the total patients of all age group, who were having normal PSA level, was 2.6 ± 2.05 ng/ml as shown in Fig.1.The elevated PSA value (the data of 20 samples for each group) in patients of all age group is shown in scatter diagram in Fig.3.

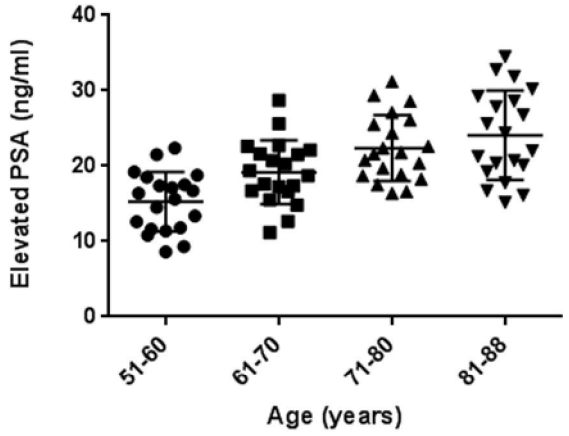

Figure 3. The elevated PSA value in different age group of patients

The blood samples of patients of the respective age groups were assayed for PSA level. The elevated PSA value in the different patients of all age group. (The data of 20 samples of each group is shown).

The normal level of PSA (the data of 20 samples for each group) in all age group of patients is shown in scatter diagram in Fig.4. Age group (51-60), (61-70), (71-80) & (81-88) had normal mean PSA value as 2.04, 2.46, 2.84 and 3.04 ng/ml respectively, as shown in Fig.4.

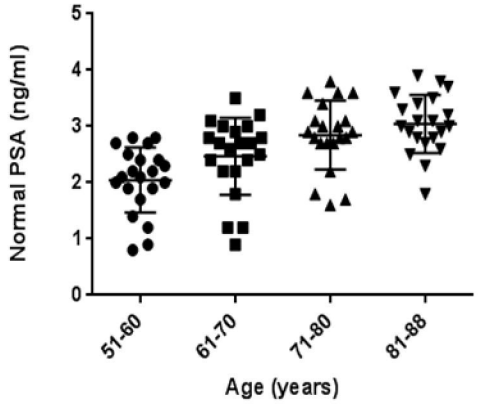

Figure 4. Normal level of PSA in patients of different age group

PSA level was estimated by the blood samples of patients of all age group. Normal level of PSA in the different patients of all respective age group. (The data of 20 samples of each group is shown).

Discussion

PSA is considered as the most valuable serum tumor marker for the successful diagnosis and post-surgical management of Pca. The improved rate of detection of prostate cancers has become largely possible because of routine use of PSA immunoassays. These days, PSA is measured in its various molecular forms and been employed in clinical practice [7,8].

Epithelial cells of all types of prostatic tissue, benign and malignant produce PSA. The peri urethral glands produce extra prostatic PSA, which is measurable in urine but cannot be detected in serum in women and in men. The liquification of the ejaculate, done by PSA, increases the motility of sperms [9]. The escape of high concentrations of PSA are generally restricted to general circulation by Glandular ducts. In various disease conditions of the prostate, like prostate cancer, causes the increase of PSA outflow into the serum.

The present piece of work has been taken up with an objective to measure and compare the elevated diagnostic level of PSA in various patients with the normal PSA range obtained within the same patient population. The patients, screened for PSA, have been categorized into different age group and in all group it was seen that certain number of cases had significantly high level of PSA. The highest PSA value was upto 34.5 ng/ml, observed in age group of 81-88 years, as shown in Fig. 2. The highest mean PSA level was 24.5 ± 7.2, observed in age group (81-88) as shown in Fig. 1. The mean PSA value of 49.8 ± 6.0 ng/ml has been reported in one study, which was carried out in Chinese men suffering with prostate cancer [10]. Our study revealed that 1692 patients of all age group were having PSA range within normal limit and the mean PSA of their normal range was 2.6 ± 2.05 ng/ml. In our present study, the normal mean PSA value of age group (51-60), (61-70), (71-80) and (81-88) were 2.04, 2.46, 2.86 and 3.04 ng/ml respectively as shown in Fig. 4.

While comparing our result with the reported cases from other countries, it seems to be similar with not much of significant difference. For example, the mean PSA value of patients of age groups (30-39), (40-49), (50-59), (60-69) and >70 has been reported as 0.86 ± 0.81, 1.21 ± 0.6, 1.59 ± 0.67, 2.12 ± 0.84 and 2.76 ± 0.91ng/ml respectively in prostate disease-free Chinese men population [10]. Similarly, the mean PSA value in Spanish workers without prostate problems in the age group of under 40 years, (40-49), (50-59) and (60-64) has been reported as 0.67 ± 0.49, 0.77 ± 0.66, 1.11 ± 1.22 and 1.57 ± 1.72 ng/ml respectively [11]. Age-

specific PSA reference level of men without prostate cancer in Japan and Iraq [12,13] has been also reported to be similar to that in China and Spain. Hence the reports of age-specific PSA reference level from various countries looks to be similar with the results of our present piece of study carried out in eastern part of Nepal.

The age-specific PSA reference range reflects the association between PSA and age. As men's age increases, the value of their serum PSA also increases. This is because of the enlarged prostate and increased leakage of the prostatic epithelium. It seems to be due to the subclinical inflammation or microscopic foci of cellular atypia [14].

In this present study, we can see in Figure 1 that the higher age group had more level of elevated mean PSA than lower age group. Elevated PSA value shown in scatter diagram in Fig. 3 also shows that higher age group had higher PSA value. Normal PSA value is also higher in higher age group. Normal mean PSA value of 81-88 age group is 3.04, which is more than normal mean PSA value of other age group as shown in Fig. 4. So the present study reveals that there is association between PSA level in serum and age of the patients.

Conclusion

PSA is used as a tool in the diagnosis and management of prostate cancer. However, the number of deaths related to prostate cancer diagnosed by PSA screening has appreciably decreased, it is dubious to say that this is only due to PSA. The distinction between the patients with prostate cancer from those without can't be done exactly by the level of PSA. Therefore, PSA screening programme has obviously assisted the diagnosis of many clinically insignificant prostate cancers and subsequent aggressive treatment with not much of clinical benefit. So in this study, we have shown the elevated and normal range of PSA, in different age group of patients in eastern part of Nepal, which has got the significant value in the differential diagnosis of prostate.

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