Original Article

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Investigation of the Cut-off Value for Prostate-Specific Antigen in Patients referring to Shahid Beheshti Hospital of Babol

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ABSTRACT

BACKGROUND AND OBJECTIVE: Prostate cancer is the most common form of malignancy among men. Prostate-specific antigen (PSA) is used to screen for prostate cancer and may vary depending on different factors, such as age. This study aimed to investigate the cut-off value for PSA in patients diagnosed with prostate cancer.

METHODS: This cross-sectional study was conducted on patients with prostate biopsy diagnosis undergoing transrectal ultrasound during 2011-2014. Data collection was performed using prepared checklists.

FINDINGS: In total, 422 patients were enrolled in this study, 180 of whom (42.7%) were diagnosed with adenocarcinoma, and 242 (57.3%) had benign prostatic hyperplasia (BPH). Mean age of the patients was 63.03±9.62 years, and the mean PSA was 27.95±64.44 ng/ml. The mean of PSA in patients over 51 years was 28.66±65.51 ng/ml, which was significantly higher than the values of the patients under 50 years of age (p=0.005).

CONCLUSION: According to the results of this study, the risk of prostate cancer was higher in the men within the age range of 60-80 years. In addition, patients with PSA levels of 10-20 ng/mL need to be fully screened for prostate cancer.

KEY WORDS: Prostate Cancer, Prostate-Specific Antigen, Adenocarcinoma, Needle Biopsy.

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Introduction

Prostate cancer is the second most prevalent type of cancer and the third main cause of cancer-related mortality among men in developing countries (1). In one study, Graif et al. stated that almost 18% of men are diagnosed with prostate cancer during their lifetime, about 3% of which leads to death (2). According to the U.S. Cancer Statistics Working Group in 2012, there are reports of 196,038 cases of prostate cancer diagnosis and 28,560 cases of recorded deaths caused by this disease. These results have been registered in the United States Department of Health and Human Services, Centers for Disease Control and Prevention, and the National Cancer Institute (3).

Due to the high prevalence of prostate cancer in the adult male population, planning effective protocols for regular cancer screening has been a major concern of several researchers worldwide (4,5). In the past, prostate cancer was diagnosed through digital rectal examinations or based on the prostate biopsy showing high serum levels of prostate-specific antigen (PSA). Moreover, surgeries were used in patients with benign prostatic hyperplasia (BPH) (5,6).

In 1986, the U.S. Food and Drug Administration approved PSA as a proper measurement for prostate cancer screening (5). PSA is a predominant glycoprotein found in the prostate gland, which may elevate in the blood under pathological conditions involving the prostate. This could be an appropriate marker for the detection of prostate carcinoma, and the screening procedure using this parameter is recommended for individuals over 50 years of age in the form of a yearly check-up. In this regard, ultrasound, high levels of PSA (i.e., PSA velocity), age-related reference values and measurement of free PSA could raise the predictive value of PSA in the screening for prostate cancer (7,8). This study aimed to investigate the cut-off point for PSA in patients diagnosed with prostate cancer.

Methods

This cross-sectional study was conducted on all the patients with prostate biopsy diagnosis undergoing transrectal ultrasonography from April 2011 to September 2014 in the hospitals affiliated to Babol University of Medical Sciences, Mazandaran, Iran. At least 12 samples were collected from different parts of the prostate gland and were investigated by a pathologist. The obtained data were evaluated using prepared checklists, and data analysis was performed using descriptive statistics, t-test and Chi-square test in SPSS at the significance level of $p<0.05$.

Results

In total, 422 patients were enrolled in this study, 180 of whom (42.7%) were diagnosed with adenocarcinoma and 242 cases (57.3%) had BPH. The mean of age and PSA in the studied patients was 63.03±9.62 years and 27.95±64.44 ng/ml, respectively. Out of 422 patients, 420 cases (99.5%) underwent needle biopsy, and two patients (0.5%) received transurethral resection of the prostate. In this study, the lowest rate of referrals accounted for 50 patients (11.8%) during 2011-2012 (fig 1).

Regarding the age of the subjects, 15 patients (3.6%) were under 50 years, and 407 patients (96.4%) were over 51 years. In addition, PSA divisions in the group with PSA level of <4 ng/ml accounted for the lowest frequency with 11 patients (2.6%) (fig 2). The mean of PSA was estimated at 28.66±65.51 ng/ml in patients older than 51 years, which was significantly higher than the values obtained in the patients under 51 years

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(8.68±3.72 ng/ml) (p=0.005). Moreover, a significant association was observed between the division of PSA and disease diagnosis (p<0.0001) (table 1).

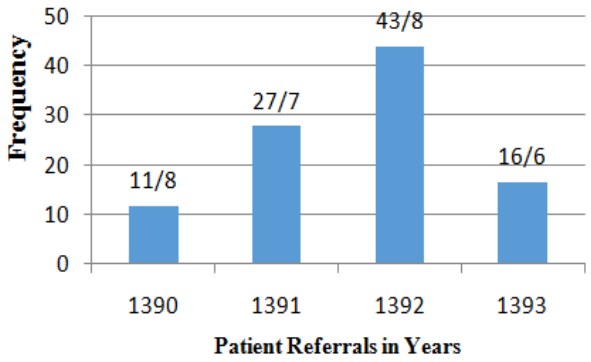

Figure 1. Distribution of the frequency of patient referrals in different years

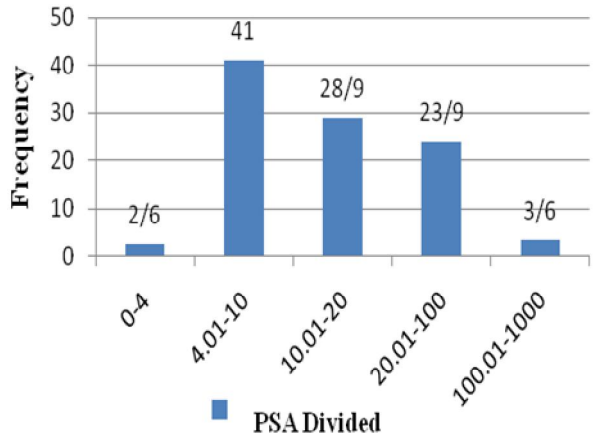

Figure 2. Distribution of the frequency of prostate-specific genes in the studied patients

Table 1. Frequency of different prostate-specific gene groups in patients with adenocarcinoma and BPH

Prostate-specific antigen (PSA)	Adenocarcinoma N(%)	Benign Prostatic Hyperplasia (BPH)N(%)
0-4	1(9.1)	10(90.9)
4-10	47(27.2)	126(72.8)
10-20	51(41.8)	71(58.2)
20-100	66(65.3)	35(34.7)
100-1000	15(100)	-

Discussion

In the present study, the mean of PSA was higher in older patients. According to the literature, prostate cancer is the most common type of malignancy among men and the second main cause of cancer-related mortality worldwide (9). Despite the fact that patients with prostate cancer may remain asymptomatic, PSA test is considered as the most reliable diagnostic test for this disease (9,10).

In a study by Abdolhosseini et al. (2011), the level of PSA was reported to be 66.1 ng/ml in the patients within the age range of 60-69 years, while the mean of PSA in these patients was estimated at 35.1 ng/ml.

Therefore, it could be concluded that the mean of PSA increased in patients over 60 years of age, which is consistent with the findings of the current study (10). On the other hand, the results obtained by Farahmand et al. indicated that the incidence rate of prostate cancer was higher at the age of >80 years (11), which does not correspond with the findings of the present study. In the study by Farahmand et al., 98.3% of the patients older than 50 years had adenocarcinoma, which is suggestive of the fact that old age involves the higher risk of prostate cancer. Similarly, the study conducted by Rajai et al. reported increased age as a major risk factor for the incidence of prostate cancer (9), which is in line with the findings of the current study. In the study by Rajai et al., PSA level of 0-20 ng/ml was observed to be associated with a lower incidence rate of prostate cancer compared to BPH.

However, PSA level of >20 ng/ml was found to be associated with higher adenocarcinoma of the prostate surpassing BPH. This is indicative of the fact that PSA level of >20 ng/ml could lead to the increased incidence rate of prostate cancer. In another study by Jebel Ameli et al., the patients were divided into three groups based on their PSA

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levels. According to the results, the rate of prostate cancer was very low at the PSA levels of <4 ng/ml, while it was reported to be 69.7% in patients with PSA of 4-10 ng/ml and 81.8% in patients with PSA levels of 10 ng/ml (12). Consequently, they concluded that higher levels of PSA could lead to increased rate of prostate cancer, which was consistent with the results of the current study.

One of the limitations of our study was the small sample size, as well as the lack of free PSA measurement. Therefore, it is recommended that a cohort study be performed in order to predict the exact incidence rate of prostate cancer at different levels of PSA. In conclusion, the results of the present study indicated that the risk of prostate cancer could increase in the men within the age range of 60-80 years compared to other age groups. Furthermore, patients with PSA levels of 10-20 ng/ml need to be fully screened and followed-up in terms of prostate cancer incidence.

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