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Prostatic Specific Antigen and its Correlation with Prostatic Cancer in a Sample of Iraqi Population

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Abstract

This study is directed at prostatic specific antigen (PSA) and its correlation with different Iraqi patients both normal and afflicted with prostatic cancer where numerous patients in Baghdad were screened for this tumor marker and their data collected after testing, this study included (51) persons diagnosed with prostatic cancer, collected from Baghdad medical city, and (22) patients as control for screening , both in different age groups (50-59,60-69,70-79,80-89), results and correlations were calculated using IBM SPSS 20, through observing of the data collected and the comparison with normal standard levels, it is evident that an increase in PSA levels is strongly correlated with tumors of the prostate, also a correlation is apparent between the Gleason scores of prostate cancer patients and also their PSA levels.

Keywords
Prostate specific antigen, Gleason scores, Prostate cancer

Cancer is a serious worldwide health-care concern, 46 percent of which occur in affluent nations, with an expected worldwide occurrence of ten million new cases each year. Over a quarter of the population of the United States will be diagnosed with cancer at some point in their lives, with over 1.6 million new cancer patients diagnosed each year. Surgery and/or local radiation will cure only around a fifth of these individuals. During their illness, the majority of the remaining patients will get systemic chemotherapy [(1)].

Chemotherapy will result in a cure or sustained remission in a limited percentage of individuals with cancer representing selected neoplasms (about 10%). However, in the vast majority of cases, drug therapy will only result in a disease regression, and complications and/or relapse may eventually lead to Mortality, with over 7 million deaths per year [(1,2)].

In Iraq, the annual number of new cancer cases between 1991 - 2011 is (250146) case between males and females, and in 2011 only the registry has claimed 20278 cases [(3)].

It's a complex disease marked by many temporo-spatial anomalies in cell physiology, which lead to malignant tumors. Abnormal cell proliferation is the disease's biological purpose (neoplasia).

Invasion of tissues and organs by tumor cells is the leading cause of sickness and death in most cancer patients. The molecular mechanism by which normal cells become malignant tumor cells has been the subject of extensive biomedical research for decades [4,5].

Prostate cancer is one of the most frequent cancer kinds and is increasingly regarded as one of the most serious medical issues confronting men. Prostate cancer is the leading cause of cancer mortality in the United States, accounting for 10% of all cancer deaths [6].

Prostate is a tiny gland in the male reproductive system that is around the size and shape of a walnut. It is located low in the pelvis, right in front of the rectum and below the bladder. During ejaculation, the prostate contributes in the generation of semen, which delivers sperm from the testicles to the penis. It encircles a section of the urethra, which is responsible for transporting urine from the bladder to the penis [7].

Among the Western world, prostate cancer is the most often diagnosed cancer and the second leading cause of cancer-related mortality in males [8]. Prostate cancer is more common as people become older, and more than 70% of prostate cancer patients are above the age of 65 [9].

As a result of aging society, prostate cancer will inevitably become a greater health burden in the coming years [10]. Prostate cancer is the most frequent cancer in Iraq, ahead of all other cancers, which prompted us to look at prostate tumor markers for prostate cancer diagnosis [11].

PSA (prostate specific antigen) is a protein produced by the prostate's normal cells. PSA levels have been found to be effective in screening large groups of men for prostate cancer. Although further research is needed to evaluate if PSA screening makes a genuine impact in the diagnosis of prostate cancer and survival of the patient, they have seen substantially fewer patients with advanced prostate cancer. PSA detection in the early stages of cancer is still regarded as the most essential tool marker [12,13].

Prior to the PSA era, a palpable abnormality in the prostate was required before a biopsy was conducted, and approximately 70% of men diagnosed with prostate cancer already had extra-prostatic or metastatic illness. Since the advent of PSA testing, fewer than three percent of men have had metastases at the diagnosis time, and 75% of men have nonpalpable cancer. The malignancy was discovered on biopsy in this group due to a quickly growing or significantly increased PSA level.

PSA is a 33kDa single chain glycoprotein containing 237 amino acid residues, four side chains of carbohydrate, and s-s bonds. It is related to proteases from the kallikrein family. This enzyme is important for fertility because it aids in the breakdown of seminal fluid coagulum. The seminal fluid has the highest quantities of PSA; nevertheless, some PSA escapes the prostate and is detected in the serum [14,15,16,17,18,19].

PSA levels in the blood have been linked to prostate cancer. PSA is an excellent indicator of increased prostate volume, and its levels are elevated in benign prostatic hyperplasia as well as prostate cancer. In males with acute bacterial prostatitis, PSA levels are frequently increased [20].

Since 1986, when a lot was learned about the weak and strong aspects of these tests, the introduction of PSA level assessments has profoundly improved the management and early diagnosis of prostate cancer. Furthermore, these tests would not only serve in identifying men who require a prostate biopsy, but they would also aid in evaluating response to medication, determining tumor development, and, perhaps most controversially, prostate cancer screening [21, 22, 23].

In 2010, the American cancer society modified their guideline for early prostate cancer detection, emphasizing the importance of incorporating men in the decision to test for prostate cancer. PSA testing, according to the American Cancer Society, may lower the chance of dying from

prostate cancer, but it also carries substantial hazards, especially those associated with the treatment of prostate cancer that would not have been harmful if remain untreated [24].

Despite being found mostly in prostate tissue and/or sperm, the label "prostate specific" appears to be a misnomer, as it has been detected in various tissues and physiological fluids [25]. PSA is detected in women, particularly in female ejaculate, in a concentration that is similar to that seen in male sperm [26]. PSA is found at the highest amounts in breast milk and amniotic fluid, in addition to male and female ejaculate. Lower PSA concentrations in the urethral glands, breast tissue, salivary gland, and endometrium follow. Furthermore, individuals with breast, lung, and uterine cancers, as well as those with kidney cancer, had higher PSA levels in their blood [27].

Methodology

Sample Collection

From July to December (2016), human serum samples were collected at Baghdad Medical City, which involved (51) patients with prostatic carcinoma and (22) normal patients as control, these results were gathered from said patients after being analyzed at the stated facilities, this data was then subjected to statistical assessment by the IBM SPSS program which comprised of the arithmetic mean, standard deviation, SEM, both extremes, 95% CI, and statistical significance as P-value >0.01.

Principle

The test combines a two-stage enzyme immunoassay sandwich approach with a fluorescence detection step at the end (ELFA). The Solid Phase Receptacle (SPR) is used for both the solid phase and pipetting in the assay. The assay's reagents are pre-fluidized and ready-to-use in sealed reagent strips.

The equipment performs all of the assay processes automatically. Several times, the sample is cycled in and out of the SPR. This procedure allows the antibody attached to the SPR's internal wall to catch the prostate-specific antigen in the sample. During the washing process, unbound components are removed. The SPR is then treated with the alkaline phosphatase labeled antibody, which binds to the prostate specific antigen. The conjugate enzyme hydrolyzes this substrate (4-Methyl-umbelliferyl phosphate), resulting in a fluorescent product (4-Methylonset umbelliferon) with a fluorescence of 450 nm. The amount of prostate specific antigen contained in the sample is proportional to the fluorescence intensity. VIDAS calculates the results in relation to the calibration saved in memory at the end of the assay.

Results

All of the (51) patients were divided into age groups (50-59, 60-69, 70-79, 80-89) containing (6, 15, 20, 10) respectively. Running patient data through the SPSS edition program resulted in the following: Table 1 possesses age, PSA, Gleason score statistics of the prostate cancer patients where means of PSA and age are 70.9 and approximately 70 respectively, table 2 possesses statistical correlations between the previous three parameters, table 3 and 4 has PSA levels divided upon age groups, table 5A and B contain the independent sample T test showing P-values and the mean. Table 6 shows the paired sample T test of PSA levels before and after treatment.

Table 1: PSA Level Statistics in Patients with Prostatic Cancer

Age groups (years)	Number of Samples	Percent	Mean	Standard deviation	SEM	95% CL	Range
50-59	6	11.538	63.61	32.583	13.3	29.41-97.8	19.42-100
60-69	15	28.846	60.07	38.568	9.958	38.72-81.43	10-100
70-79	20	38.462	69.059	33.136	7.409	53.55-84.57	8.46-100

80-89	10	19.231	87.534	27.358	8.651	67.96-107.1	17-100

Table 2: Prostatic Cancer Statistics

Parameter	Number of Samples	Range	Minimum	Maximum	Mean	Standard Error	StandardDeviation	Variance
Age	51	31.00	55.00	86.00	70.5882	1.13316	8.09241	65.487
PSA	51	91.54	8.46	100.00	69.3976	4.79081	34.21323	1170.545
Gleason	51	3.00	6.00	9.00	7.4706	0.1401	1.00703	1.014

Table 3: Statistical Correlation

		Age	PSA	Gleason
Age	Pearson Correlation	1	0.207	0.000
	P-Value	-	0.146	0.998
PSA	Pearson Correlation	0.207	1	0.547
	P-Value	0.146	-	0.000
Gleason	Pearson Correlation	0.000	0.547	1
	P-Value	0.998	0.000	-

Table 4: PSA Levels in Normal Patients

Age groups (years)	Number of Samples	Percent	Mean	Standard deviation	SEM	95% CL	Range
50-59	1	5	0.07	-	-	-	0.07
60-69	7	31.8	1.381	1.232	0.4656	0.24-2.52	0.07-3.9
70-79	13	59.1	1.082	1.172	0.325	0.374-1.79	0.07-3.4
80-89	1	5	0.8	-	-	-	0.8

Table 5A: Independent Sample T Tests for All Patients and control group

		Levene's Test for Equality of Variances	
		F	Significance
PSA Level	Equal Variances Assumed	92.662	0.000
	Equal Variances NOT Assumed		

Table 5B: Independent Sample T-Tests for All Patients and control group

		T-test for Equality of Means						
		T	Degree of Freedom	P-Value	Mean Difference	Standard Error Difference	95% CL	
							Lower	Upper
PSA Level	Equal Variances Assumed	8.639	68	0.000	68.13080	7.88681	52.39292	83.86869
	8.639	14.199	50.307	0.000	68.1308	4.79817	58.49485	77.76676

Table 6: Paired Samples T Test

	Paired Differences					T	DF	P-Value
	Mean	Standard Deviation	Standard Error Mean	95% CL				
				Lower	Upper			
PSA Pre-PSA Post	32.28431	24.11439	3.37669	25.50203	39.0666	9.561	50	0.000

Discussion

This sample size was governed by the time period length , from the data shown in Table 1, its apparent how the mean of PSA levels increases with age, it also shows that the number of patients with prostatic malignancy increases with age as well and slightly lowers in the last age group, these observations are also noted in Table 4, where the control group (normal patients) exhibit higher mean values especially

between the 3rd and fourth groups, This observation of course is not negated by table 2 whereas in table 1 the general means of the age groups increase overall but the high individual increase can occur in any age group, from table 3 the PSA levels and age groups person's correlation appears to be insignificant (0.199) in addition to the high P value (indicates insignificance), the same goes for the age differences and gleason scores, that being said it is evident that there is a positive correlation between PSA scores and gleason scores, where the Pearson's correlation is significant and the P value is less than 0.01.

In addition,table 5A and B shows the difference between the PSA levels in all prostatic cancer patients and also the significance of that difference where the P value is 0.000 meaning that the PSA level does in fact increase with the presence of prostate carcinoma. Moreover, table 6 states that the treatment is in fact significant (0.000) at the 0.01 level hence treatment does reduce circulating PSA levels in prostatic cancer patients.

As a conclusion, it is evident that an increase in PSA levels is strongly correlated with prostatic cancer in a sample of Iraqi population, also a correlation is apparent between the Gleason scores of prostate cancer patients and also their PSA levels.

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