

# Assessment of Prostate Cancer Radiation Therapy Using PSA Level

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**Abstract:** This an analytical study aimed to assess radiation therapy for prostate cancer patients using PSA level in order to assess the treatment outcome in term of cellular reduction of PSA production, a total of 193 patients, age range (39-88) years old with mean (69.1±9.4) years prostate cancer treated with surgery (Partial and Total removal; partial dominant) and radical radiotherapy were included. Those patients referred to RIA lab at RICK, the study variables was included PSA level, age, TNM stage, weight, marital status, family history. The data collected using master data sheet after filling a questioner and analyzed using EXCELL software and statistical package for social science IBM-SPSS (21.0) in form of clustered column and curves. The result show overall 93 patients were reached references levels of PSA less than 1 and 1-4ng/ml which represented 48.1 percent in mean follow up for two months. The PSA-3 (After Radiation) was (17.1 ± 24.1 ng/ml) for those with PSA-1 (Frist) were (87 ± 48.6 ng/ml). Stage II (130) patient (67.36%) & age group (64-70) years 61 patients (30.5%) were dominant. This study also reveals that there is a significant difference between PSA levels before and after treatments at p=0.000 (CL=95%), also the effect of surgery it seem to be more effective rather than radiotherapy in which mostly related to the delayed period between the planning procedure and treatment delivery this is mostly due to lack of machine availability at area of the study.

**Keywords:** Prostate cancer, Prostate-specific antigen, Radiation therapy and treatment outcome

## 1. Introduction

Prostate specific antigen (PSA) is a well-known Tumor biomarker approval in 1986, produced by certain cells in the prostatic gland that liquefy the semen (Wang et.al, 1981). Most of the PSA produced by the prostatic gland is carried out of the body in semen but a small amount escapes into the blood stream. PSA circulated in blood stream freely or join with other substances in the blood as bound PSA. Total PSA is the sum of free and bound forms. This is what is measured as the standard PSA test. PSA test may be used to screen for cancer of the prostate and to monitor disease progress and treatment. The abnormal amount of PSA level in blood stream indicates for disease (prostatitis), prostate adenocarcinomas, benign hyperplasia (BPH) (enlargement of the prostate). Prostate cancer is a malignant tumor that arises in the prostate gland. The carcinoma of prostate constitutes a major and escalating international health problem. In both developed and developing countries prostate is the most commonly diagnosed life-threatening malignancy in men accounting for almost 25% of all new male cancer diagnosis, and seem to be overtake the lung cancer as the major cause of cancer death. (Parker et al. 1997). A total of 78% of Sudanese patients have stage III or IV disease (TNM classification) when they first seek medical treatment. (Data from Sudan Federal Ministry of Health). The common type of prostatic disorders was the adeno-carcinoma (84%), state which had age group with high PSA level was (56-66) years with relative level 80.7 ng/ml, histopathological had a high mean of PSA level was adenocarcinoma with relative level 56.1 ng/ml.

These results indicated the possible use of PSA to determine the reference prostate specific antigen (PSA) range for different type's prostatic disease patients in Sudanese men, (Yousif and Omer, 2013). The normal range which is in the range of 0–4.0 (ng/ml) (Jama, 1997) above it give clue for

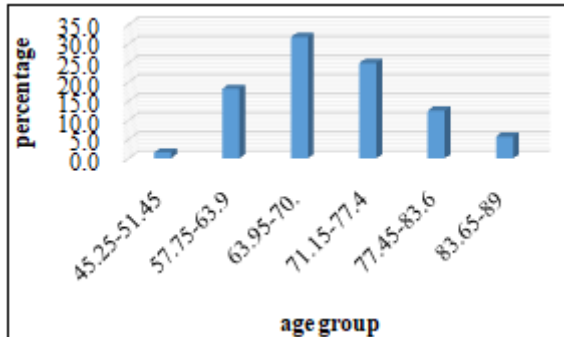
disease types, treatment outcome and decision of further treatment required. Since prostate cancer is one of the most common cancers in male, follow up during and after treatment and evaluation of the outcome is very crucial issue that helps in creating a baseline for further improvement (Prognosis) and ease in the delivery of treatment. Therefore the using PSA in respect age, stage in CaP patients can help us to obtain a better evaluation of therapeutic responses to ongoing therapies (RT was focusing of this study). This Study of CaP have globe objective which was evaluating level of PSA after radiotherapy (PSA-3) in addition of by product. Objectives estimating percentage of patients response to radiotherapy, to find correlation between PSA-3 and PSA-1 after finding PSA level firstly (PSA-1) and classify the patients into definite groups according to Patients age and TNM stage.

## 2. Material and Method

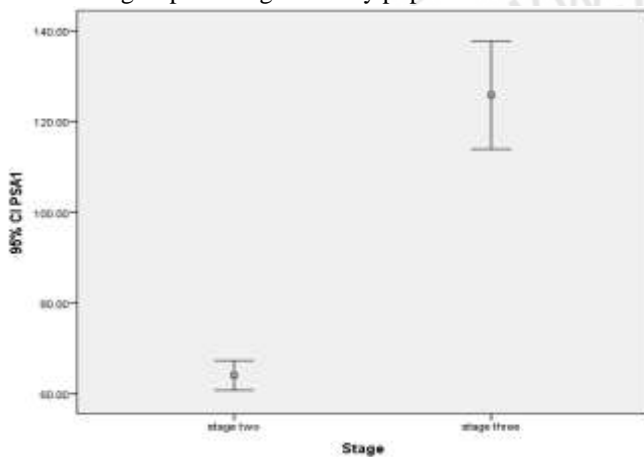
The study was conducting in RICK-RIA lab using (PC-RIA-MAS STRATEC). A sample size of 193 patients with Localized CaP treated with radically (Radiation therapy and surgery). The data collected using a questioner then filling normal master data sheet with variables of Age 25-90 years, Weight, TNM stage II-III, Tribe, Type of surgery, time of follow up and between Surgery and Radiotherapy. The collected data was analyzed using EXCELL software and statistical package for social science SPSS 21.0 in forms of 3D clustered column and curves. The procedures of PSA measurement including I<sup>125</sup> labeled signal-antibody binds to an epitope of PSA molecule different from that recognized by the unlabeled capture-antibody, the two anti-bodies react with the PSA molecule forming a “Sand-wish”. Standard and samples are incubated with mixture of the anti-body at room temperature, at the end of 2 hours incubation period (no need of a shaker), magnetic immunosorbent (MIS) is added in

excess, MIS particles selectively bind the PSA signal antibody capture, anti-body complex and settle out in magnetic field. A wash step is critical to reducing nonspecific binding to a minimum for increased low end precision Gammas counter.

### 3. Results



**Figure 1:** Bar graph show the frequency distribution of age groups among the study populations.



**Figure 2:** An error bar demonstrates the variation of PSA-1 (level before the treatment) according to the stage of the disease

**Table 1:** Demonstrate significant pair sample t-test for PSA level according to the treatment type

Paired Sample Test	Paired Differences		t	Sig. (2-tailed)	
	Mean	SD			
Pair 1	PSA1-PSA2	70.7	42.9	22.7	0
Pair 2	PSA1-PSA3	66.8	46.6	19.8	0

PSA-1= level of PSA Before Surgery or Radiotherapy  
 PSA-2= level of PSA after Surgery  
 PSA-3= after radiotherapy

**Table 2:** Statistical values of the age, PSA and body weight

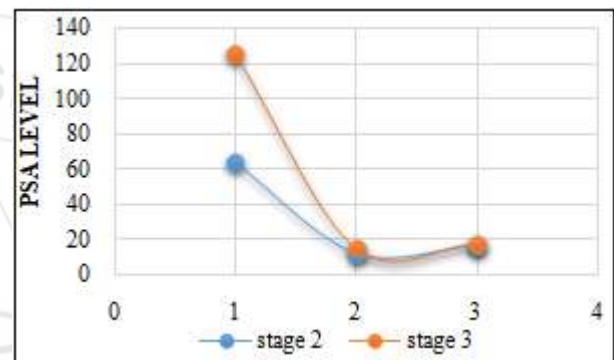
Variables	Mean	Std. Deviation
Age	5.286	1.4276
PSA1	83.9802	42.15385
PSA2	13.41	15.784
PSA3	17.34	24.396
Weight	64.615	9.4917

**Table 3:** Stated the difference of PSA level according to the stage of the disease (stage two and three)

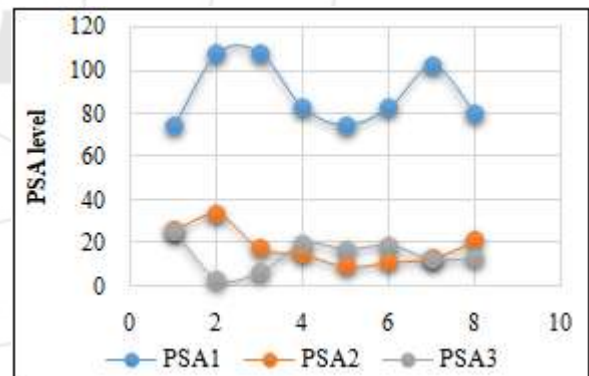
Group Statistics				
	Stage	N	Mean	Standard Deviation
PSA1	Stage two	130	64.04	18.8
	Stage Three	62	125.8	46.8
PSA2	Stage two	129	12.46	13.2
	Stage Three	62	15.39	20.1
PSA3	Stage two	129	16.96	23.3
	Stage Three	62	18.13	26.7

**Table 4:** An independent sample t-test for PSA level

Independent Samples Test		
	t-test for Equality of Means	
	t	Sig. (2-tailed)
PSA1	-13.025	0
PSA2	-1.201	0.231
PSA3	-0.309	0.757



**Figure 4:** Showed the Mean Plot of PSA Level According to the stage of disease as in table (3).



**Figure 5:** Showed the mean difference of PSA level according to age group of the study populations

**Table 5:** Demonstrate the difference in PSA value for different active age group

Age group	No	PSA1	PSA2	PSA3
39-45.5	5	74.84	26.4	25.6
45.5-51.5	3	108.6	33.9	3.7
51.5-57.5	5	108.5	18.1	7
57.5-64	35	83.07	15.2	20.1
64-70	61	75.4	9.7	17.5
71-77.5	48	83.8	11.7	19.3
77.5-83.5	24	102.9	13.6	12.8
83.5-89	11	80.3	21.7	13.4
Total	192	84	13.4	17.3

**Table 6:** Shows the Number of Patient and Percentage of reduction of PSA3 (Prostate Specific Antigen):

PSA3 (ng/ml)		
Reduction of PSA	N. Patients	Reduction (%)
Less than 1 (ng/ml)	48	24.8
From 1 To 4 (ng/ml)	45	23.3
More than 4 (ng/ml)	100	51.8

#### 4. Discussion

The out result of this study documented of mean of two months follow up that PSA3 level was reduced to (17.1±24.1 ng/ml) for those patients coming with PSA1 (87±48.6 ng/ml), (Table 2) Stage II was dominant in 130 patients represented 67.3 percent and stage III was about 63 patients which was represented 32.6%. The younger age was 39 years while older patient was 88 years with mean ± STD (69.1±9.4 years). There were eight age groups, most common age group was 64-70 years with 61 patients (30.2%) and less common was 45.5-51.5 years with 3 patients (1.2%) (Table 5) fig (5).

PSA3 levels were reduced for patients in stage II (17±23.2ng/ml) compared with stage III which was (18±26.7ng/ml) (Table 3.) fig (4). Moreover PSA3 was lesser 3.7ng/ml in age group 2 45.5-51.5years and greater 20.1ng/ml in group (57.5-64) years Fig 5, (Table 5). There was an inverse relation between PSA3 and PSA-1; PSA3 was less for those patients with PSA1 small level by 0.038ng/ml. A significant correlation between PSA1-3 determined using T-paired sample test with t=19.8 and P=0.000, with differences in means =66.8 ±46.5ng/ml.

Nevertheless the result show overall 93 patients were reached references levels of PSA less than1ng/ml (48 patients (24.8%)) and 1-4ng/ml (45 patients (23.3)) in mean follow up two months. The limitation of this study was the majority of patients PSA's level was not reduced to acceptable level indicated metastasis or recurrent represented 100 patients with PSA3 more than 4ng/ml (Table 6).

A pair sample t- test demonstrate significant difference between the PSA level before treatment and after both radiotherapy and surgery at p=0.000 for both test while the mean difference between PSA1 and PSA2 equal to 70.7ng/dl and equal to 66.8 ng/dl for PSA1 and PSA3 as showed in table.1.

Prostate specific antigen significantly differ for each stage according to this study there is a significant difference among the study population for PSA before the surgery and radiotherapy at p=0.000 (CL=95%) where for 130patient PSA= (64.04±18.8), for stage two and (125.8±46.8) 62 patient having stage three while this is reduced totally to the lower levels after surgery (PSA2) and radiotherapy for stage two and stage three patient and we note the reduction rate is higher after surgery while the radiotherapy (PSA3) is reduced the PSA level by slow rate compared to the other modalities this is strongly related to the rest period between the surgery and having radiotherapy or rest period after palliating

procedure because of limited machine availability at RICK (radiation and isotopes center of khartoum) but there is a strong correlation noted between the reduction of PSA according to stage after both treatment modalities available here (p=0.231 for surgery, p=0.757 for radiotherapy) as in table (3 and 4) figure (3). Which showed the reduction of PSA level according to stage of disease.

#### 5. Conclusion

Out of the results enumeration for this study which was dealing with evaluate of Radiation therapy course for prostate cancer patients outcome using prostate specific antigen (PSA) level. The reduction in PSA3 (After Radiation) was (17.1 ± 24.1ng/ml) for those with PSA1 (Frist) was (87±48.6 ng/ml), Stage II and Age groups 5(64-70) was dominant in this study. The response was good in 93 patients who reached references levels of PSA less than1ng/ml (48) & 1-4ng/ml (45) patients but about 100 patients have PSA3 more than 4 ng/ml represented the majority that due to ideal Radiation course and interval between RT and Surgery (Partial was more) 2.5 months and absent of follow-up data base except after 3months of completion of treatment, which can indicate metastasis or recurrent diseases. We highly recommended that the government should establish many (RIA) laboratories in different states because of the PSA test are very necessary to detect the prostatic disorders and prognosis of treatment. Encouraging that issue of tumor marker should be more documented in national research.

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