

# Chapter One

## Introduction

### 1.1 Prostate Cancer:

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).

In Sudan the rate of incidence per year was 442 new cases in 2012.A known challenge to treatment of cancer in Sudan, as in most developing countries, is that most patients first present with advanced stage disease. 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 adenocarcinoma (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).

Radiotherapy (interstitial brachytherapy or EBRT) beside surgeryare the modern modalities in treatment of prostate cancer, Radical treatments with one of this treatments have similar outcomes. The results of radiotherapy are

assessed by monitoring the PSA, DRE and symptoms and signs of metastases.

## **1.2 Overview of Prostate Specific Antigen (PSA) as Cancer Biomarker:**

PSA is a protein (Tumor marker) 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 very small amount escapes into the blood stream. PSA circulates in blood stream freely or it can 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.

The serum PSA levels are normally very low. A test for PSA may be used to screen for cancer of the prostate and to monitor treatment of the disease. Elevated serum PSA level has become an important marker of many prostate diseases – including (benign prostatic hyperplasia, prostatitis, and prostate cancer) which should be above the normal range which is in the range of 0 – 4.0 (ng/ml) (Jamal, 1997). It also gives a clue for disease types, treatment outcome and decision of further treatment required. If the PSA is persistently raised following surgery, it may indicate local or metastatic disease. After negative staging investigations, metastases are still likely if the PSA doubling time is 9 months, and local radiotherapy is therefore not recommended. Seminal vesicle or lymph node involvement, especially with a high Gleason score, also correlates with risk of metastases and makes radical local radiotherapy inappropriate. If there is a persistently raised PSA with a doubling time 9 months and there are positive margins at the site of extracapsular extension, local radiotherapy should be considered. Results are better with early salvage radiotherapy when the PSA is (1.2ng/mL).

(or 0.2 with the supersensitive assay). In patients in whom PSA later rises on three consecutive occasions (ASTRO definition of biochemical failure), salvage radiotherapy is also offered. Several biomarkers with specific indications for disease diagnosis, prediction, prognosis, and therapeutic response are now commercially available.

The prostate-specific antigen (PSA) biomarker has been widely used to screen men for prostate cancer. The era of PSA in clinical use has been started. After its approval by the US Food and Drug Administration (FDA) in 1986, the PSA test revolutionized the PCa screening and diagnosis landscape. In the US, approximately 19 million men are screened annually with PSA testing, resulting in more than 1.3 million biopsy procedures and 240,890 new diagnoses of PCa.

The measurement of PSA could be carried out by PSA blood tests combined with a rectal examination (DRE) in men over 50 years old, a urine test may be used to detect a urinary tract infection or blood in the urine, (laboratory), PSA screening test for early detection of prostate cancer (such as ultrasound, x-rays or cystoscopy) and Radio-immunoassay for PSA level. Nevertheless, there are some methods preferable than others based on monoclonal antibody technology suggest that men younger than age 50 should have a PSA level below 2.5 ng/ml, while a PSA level up to 6.5 ng/ml would be considered normal for men in their 70s years old (Brawer, 1995). The mechanism by which the PSA increases or decreases is associated with the cell proliferation (Hugosson et al, 2004).

### **1.3 Problem of Study:**

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 and ease in the delivery of treatment. Using of prostate specific antigen is helpful in many ways example; to reduce the use of interventional strategies and, especially when disease is microscopic (below the limit of detection for imaging). 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).

### **1.4 Objectives of the Study:**

#### **1.4.1 General Objective:**

The general objective of this study was to evaluate radiotherapy of prostate cancer patients using PSA, to have a global picture about outcome and efficiency of the treatment.

#### **1.4.2 Specific Objectives:**

- To find-out PSA amount in patient with prostate cancer at time of diagnosis.
- To measure the amount of PSA after radiotherapy.
- To estimate the percentage of patient response to radiotherapy.
- To find a significant differences between PSA before and after treatment.
- To classify the patients into groups according to patients age & disease stage.

## **1.5 Significant of Study:**

The study was focus on evaluation of radiotherapy of CaP patient utilize PSA test as predicator, which can lead early detection of both prostate cancer and recurrences following primary treatment. The utility of this cancer biomarker can guide determining how cancer response to current type of therapy according to the resultant amount of PSA after completion of radiotherapy course; thus define a better cancer treatment and control rates for these patients, and improve the survival rate through maximizing the privilege of follow-up for PCa cancer patients.

## **1.6. Overview of the study:**

This study was consisting of five chapters, with Chapter one was an introduction introduce briefly this thesis and contain (Prostate cancer, PSA era, clinical uses, and methods of PSA testing, other biomarkers can be used, radiotherapy of PCa). Chapter two was aliterature reviews previous studies about the PSA and prostate cancer relationship over the time, biomarkers in cancer detection and it importance and effect of radiotherapy on PSA and their relation. Chapter three wasdescribing the exact methodology (material, method) had being used. Chapter four was including a result of presentation of final of study and Chapter five was contain the discussion, conclusion and recommendations for future scope in addition to references and appendices.