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THYROID FUNCTION TEST EVALUATION IN PROSTATE CANCER PATIENTS IN KHARTOUM STATE

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Abstract: Thyroid hormones (TH) are key regulators of essential cellular processes, including proliferation, differentiation, apoptosis, and metabolism. Thyroid hormones have an important role in the development of prostate cancer. So this study aims to assess thyroid function tests among prostatic cancer patients.
Total group study100, fifty Prostatic cancer patients as a case study and 50 healthy men as the control group, blood samples were collected for measurement for thyroid function test and Prostate Antigen by Tosoh ™ device (China) and enzyme-linked immune sorbent assay (ELISA) Fortress ™. Results: Statistical analysis of test results of the case study: the mean and SD± PSA= (31.8 ± 12.5), T3 = (3.3 ± 1.3), T4 = (119.58 ± 46.21) and TSH =(4.6 ± 3.4) . For each P-value 0.0001 when compared to the control group, the frequency of thyroid disorders among case study participants is hyperthyroidism (33 = 66%), normal (14 = 28%), and hypothyroidism (3 = 6%).Hyperthyroidism is the most common thyroid disorder among patients with prostatic cancer.

Keywords: Prostate cancer, Thyroid hormones, T3, T4, TSH, and Prostate Antigen.

Introduction

Prostate cancer develops when the rates of cell division exceed those of cell death, leading to uncontrolled tumor growth. Following the initial transformation event, further mutations of a multitude of genes, including the genes for retinoblastoma, can lead to tumor progression and metastasis. Most prostate cancers are adenocarcinomas [1, 2, 3]. Triiodothyronine (T3) and its prohormone thyroxine (T4) are hypothesized to promote carcinogenesis through their important roles in cell differentiation, growth, and metabolism [4]. The hormones also promote tumor-induced angiogenesis [5], and have been shown to increase prostate cancer cell proliferation in vitro [6,7]. Thyroid-stimulating hormone (TSH) is produced by the anterior pituitary gland to regulate T4 secretion from the thyroid and is an important laboratory measure for determining thyroid status [8]. In individuals with normal thyroid function, T4 and TSH act in a negative feedback loop [5]; thus, a hypothyroid state is defined as having low T4 but high TSH, and hyperthyroid status is defined as having high T4 but low TSH [9]. It is hypothesized that hypothyroid men may be at a decreased risk of prostate cancer, whereas hyperthyroid men may have an increased risk. Serum prostate-specific antigen (PSA) measurement has been widely used in screening (early detection), diagnosis, and monitoring treatment response in various stages of prostate cancer (PCa) [4]. A major disadvantage of PSA-based PCa detection is the considerable

number of false positive results that occur; many patients undergo unnecessary prostate biopsy procedures due to the false positive elevation in the serum PSA level. Various diagnostic and therapeutic procedures, as well as benign and physiologic conditions, have been shown to increase serum PSA concentrations (2-7) [10]. The close relationship between the prostate and thyroid gland Although it is very well known that thyroid hormone regulates thyrotropin-releasing hormone levels in the male reproductive system, including the prostate, the direct effect of thyroid hormones on the prostate is still unclear. evaluated the relationship between serum T3 levels and risk of recurrence in patients treated for localized prostate cancer[11]. **Materials and methods:**

Study Group

A cross-sectional study was conducted at Khartoum oncology and isotopic treatment hospital during the period from September to November 2021 .fifty patients were diagnosed with prostatic cancer aged from 26-66 years as case and fifty healthy men as control.

Inclusion criteria and Exclusion criteria: Men with prostatic cancer were involved in the study and other types of cancer patients did not be part of this study.

Ethical consideration: The study was revised and ethically approved by the ethical and scientific committee of the Faculty of Medical Laboratory Sciences, University of Alzaiem Alazhari. Samples were taken with verbal consent from patients or their relatives. **Data collection**

Data collected through a direct interview questionnaire was used to collect data. well-constructed questionnaires such as age, gender, and duration of the disease.

Collection of specimens:

Venous blood samples were collected by using sterile, dry, plastic syringes and a tourniquet to make the veins more prominent. The puncture sites are cleaned with 70% ethanol and 5 mL of blood is collected in lithium heparin containers. The lithium heparin blood sample was centrifuged at 4000 rpm to obtain the plasma and then stored at (-4 c) until the analysis.

Measurement of biochemical parameters:

Whole blood samples were collected in heparinized blood containers, and plasma was used for measurement of thyroid Function Test T3, T4, TSH, and Prostate Antigen by Tosoh ™ device (China) and enzyme-linked immune sorbent assay (ELISA) Fortress ™, thyroid function tests are designed to distinguish hyperthyroidism and hypothyroidism from the euthyroid state. To accomplish direct measurements of the plasma level of hormones, the TSH ELISA test on the principle of solid phase enzyme-linked immunosorbent assay, the assay system utilizes a unique monoclonal antibody directed against a distinct antigen determinant on the intact TSH molecule.

Normal Rang: T3 (1.3_3.1 nmol/l) T4(63_141 nmol/l) TSH (0.5_5 nmol/l)

PSA: Normal (0_4) Border(4_10) Susicious >10

Data analysis

The statistical analysis of the results was performed by using the Statistical Package for Social Sciences (SPSS) version 15.0 for Windows version 10 using a T-test for testing difference significance and a Pearson correlation test (r-value as the coefficient). A P. value of 0.05 was considered statistically significant.

Results

This case-control study involved 50 professionally diagnosed patients with prostatic cancer set as the case group. Measuring PSA as well as TFT among case and control groups, showed an elevation of each parameter (T3, T4, TSH, and PSA) among case than the control group, giving significant differences when both groups; data compared as the p-value for each <0.000 as in table 1.

In this case their age mean± SD was 66.5±6.52 years, parallel with a healthy group of men set as the control group, their age's mean SD was, patients were recruited from Khartoum oncology hospital, the majority of them from west origin 56%, then middle 22%, then northern origin 18% and lesser from south4%. Pearson's correlation showed a negative correlation between all measured parameters (T3, T4, TSH, and PSA) with the age of patients and duration of the disease, only significant difference was obtained with TSH with duration p value <0.05 as in table 2.

The correlation of PSA and TFT positive correlation with T3 and TSH, giving a significant difference, while a negative correlation was obtained with T4 with no significant difference as in table 3-3 and figures 2, 3 respectively, and 4.

Most of the patients are secondary hyperthyroidism 66% This may be due to decreased production of TSH from the pituitary gland or TSH-secreting tumor, or more rarely from the overproduction of TRH from the hypothalamus or thyrotropin-releasing hormone and other patients are 28% Normal and 3% are hypothyroidisms as in figure 1 and in table 4 the comparison of mean levels of TFTs and PSA and P value in hyperthyroidism patients

Table 1: Comparison of mean levels of TFTs and PSA among study groups

	Case group N=50	Control group N=50	p-value
T3 nmol/l	3.3 ± 1.3	1.6 ± 0.67	0.000
T4nmol/l	119.58 ± 46.21	101.6 ± 17.95	0.045
TSH nmol/l	4.6 ± 3.4	1.7 ± 0.7	0.000
PSA nmol/l	31.8 ± 12.5	1.85 ± 2.1	0.000

Table 2: correlation of age and duration of disease with TFTs and PSA

Parameters	Values	Age	Duration
T3	R	-0.033	-0.117
	P	0.819	0.418
T4	R	-0.092	-0.024
	P	0.526	0.870
TSH	R	-0.051	-0.317*
	P	0.725	0.025
PSA	R	-0.109	-0.259
	P	0.452	0.070

r=Pearson's correlation between 1 and -1. Table 3: Correlation of PSA with TFTs

Variable		T3	T4	TSH
PSA	person Correlation	0.343	-0.033	0.280
	p-value	0.007	0.803	0.029

Table 4: Comparison of mean levels of TFTs and PSA and P value in hyperthyroidism patients

variable	Hyperthyroidism N=33	Control group N=50	p-value
T3	3.1 ± 1.0	1.6 ± 0.67	0.000
T4	39.8 ± 15.4	101.6 ± 17.95	0.000

TSH	0.4 ± 0.1	1.7 ± 0.7	0.000
PSA	12.3 ± 10.4	1.85 ± 2.1	0.000

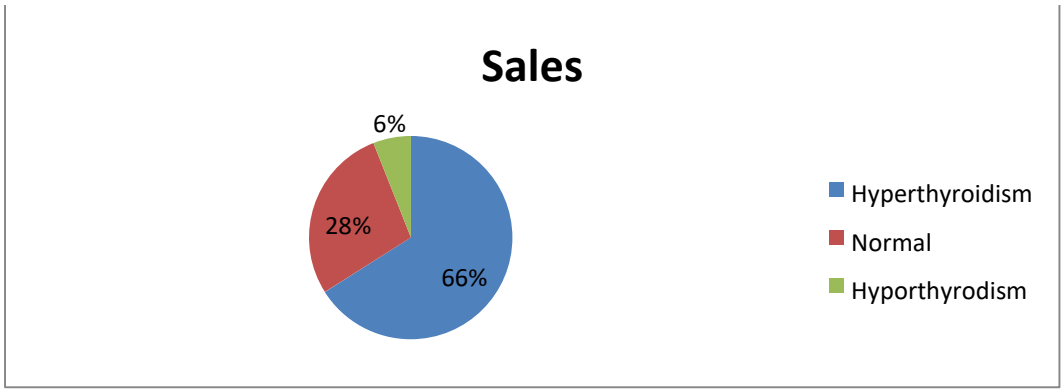


Figure 1: Frequency of thyroid disorders among case group

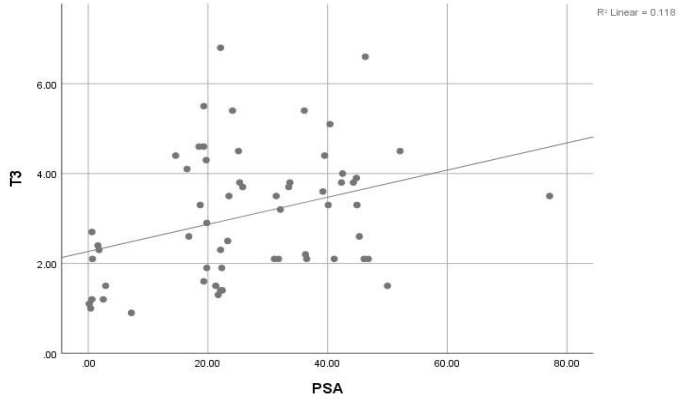
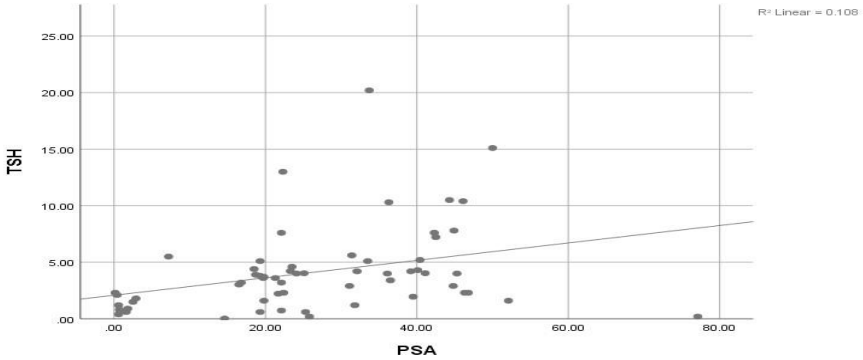


Figure 2: Correlation between PSA and T3 among case studies (P. value=0.007, r=0.34)



=0.029, r=0.282)

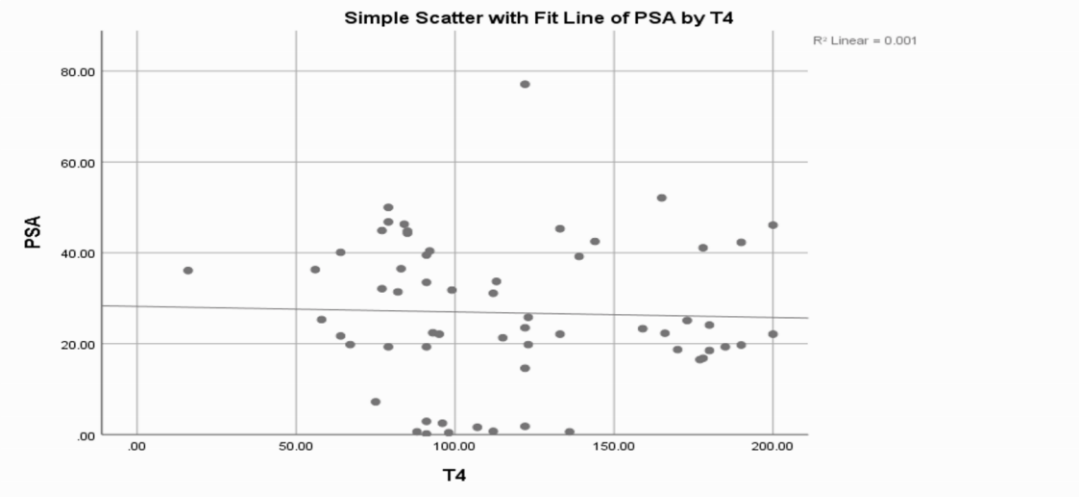


Figure 4: Correlation between T4 and PSA among case studies (P. value=0.803, r=0.001)

Discussion

Prostate cancer develops when the rates of cell division exceed those of cell death, leading to uncontrolled tumor growth. Following the initial transformation event, a variety of genes, including those for retinoblastoma, can undergo further alterations that cause tumor growth and metastasis. Adenocarcinomas are the primary kind of prostate cancer. When PSA expression was thought to be unique to the prostate gland and was thought to be raised in benign situations, the blood PSA was the most significant biochemical tumor marker utilized in the screening, diagnosis, and monitoring of patients with prostate malignancies. Regardless of the fact that it is generally known that thyroid hormone modulates the levels of thyrotropin-releasing hormone throughout the male reproductive system, including the prostate, it is still unclear how thyroid hormones directly affect the prostate. In patients receiving treatment for locally advanced prostate cancer, they assessed the connection between serum T3 levels and the probability of recurrence[12]. Nearly every tissue in the body develops, differentiates, and grows in response to thyroid hormones [13]. According to Bilek et al. [14], the thyroid gland and the rat ventral prostate have a close association. The direct impact of thyroid hormones on the prostate is still unknown, despite the fact that it is widely known that thyroid hormone modulates thyrotropin-releasing hormone levels in the male reproductive system, including the prostate [15]. In patients receiving treatment for localized PCa, Lehrer et al. [16] examined the association between serum T3 levels and the likelihood of recurrence. They classified the 68 individuals in their study into three risks identified, moderate, and high risk. In the present study patients diagnosed with prostatic cancer were set as case group, measuring PSA as well as TFT among case and control groups, showed an elevation of each parameter among cases than a control group, giving significant difference, a suggests that Secondary hyperthyroidism increase the risk of prostatic cancer. A prospective cohort study of a community-dwelling population in Western Australia between the ages of 25 and 84 found some agreement. Tests including the TSH and FT4 were performed on the archived. Along with the 41 prostate malignancies, other cancer kinds were also included. A decreased risk of prostate cancer was linked to higher TSH (P = 0.005). Similar to this, greater FT4 was linked to a higher risk of prostate cancer (P = 0.009) [17] , middle-aged males with benign prostatic hyperplasia were given hormones. Levels of free thyroxin (FT4) and thyroid-stimulating hormone (TSH) were assessed. The FT4 quartile had a large increase. No statistically significant difference was seen in TSH [18]. In previous study, thyroid hormones were found related to the pathophysiology of several cancer forms, according to study results, results from case-control and population-based studies are inconclusive when it comes to the link between thyroid hormones and cancer. Numerous pieces of evidence point to an

increased risk of various solid tumors in people with asymptomatic and clinical hyperthyroidism[19]. The results of a study agreed that there is a link between thyroid hormones and prostate cancer case-control 20]. The patients in this study were 56.7 years old on average. According to our research, elevated serum PSA levels were related to higher serum TSH, T3, and T4 levels. Previous research demonstrated lower serum TSH and greater serum T3 levels in men with benign prostatic hyperplasia and prostate cancer. Additionally, it is well-known that a number of factors can affect PSA, the most widely used biomarker for the diagnosis of prostate cancer [21]. Increased T3 levels have been linked to a number of markers of prostate cancer histopathological aggressiveness, according to a prior study [22]. According to new endocrinological guidelines [23], men with clinical or subclinical hypothyroid status had a lower chance of developing prostate cancer than men with normal thyroid function. This was found in a previous study. Similar to this, we found that males with the highest TSH levels (which indicate a hypothyroid state) had a decreased risk of developing prostate cancer. These results are in line with earlier laboratory and epidemiologic evidence that thyroid hormones affect the incidence of prostate cancer [24,25,26-29]. Another cross-sectional investigation similarly revealed that prostate cancer cases had more circulating T3 than controls did [27]. The association between thyroid hormones or status and the incidence of prostate cancer was only explored in two prospective studies [28,29]. One found that males who self-reported having thyroid disease had a higher chance of developing prostate cancer [28], but this study did not distinguish between hypothyroid and hyperthyroid conditions. TSH concentration and risk were found to be negatively correlated in the one study that looked at circulating thyroid hormone levels and prostate cancer (advanced cases were not looked at individually) [29] T4 and TSH interact negatively in individuals who have normal thyroid function [8]. Accordingly, a hypothyroid state is characterized by low T4 and high TSH, and a hyperthyroid state by high T4 and low TSH . T4 and T3 binding to the plasma membrane receptor integrin avb3 stimulates several pro-carcinogenic pathways, including PI-3K and MAPK/ERK1/2, and boosts cell proliferation and angiogenesis, which is a well-known biological mechanism via which this may occur [5]. Importantly, integrin avb3 has been linked to the spread of prostate cancer [30]. Nearly every tissue in the body develops, differentiates, and grows in response to thyroid hormones [13]. According to Bilek et al. [14], the thyroid gland and the rat ventral prostate have a close association. The direct impact of thyroid hormones on the prostate is still unknown, despite the fact that it is widely known that thyroid hormone modulates thyrotropin-releasing hormone levels in the male reproductive system, including the prostate [15]. 2001 saw Lehrer et al. It is hypothesized that hypothyroid men may be at a decreased risk of prostate cancer, whereas hyperthyroid men may have an increased risk.in this study, most of the patients are secondary hyperthyroidism 66% this increase the risk of diseases.

Conclusion

According to our findings, elevated serum PSA levels were linked to decreased serum TSH and elevated serum T3 and T4 levels. Although the mechanism of how thyroid hormones affect patients with prostate cancer is still unknown, further studies are needed to corroborate the results of our study. Hyperthyroidism is more common than hypothyroidism among patients with prostate cancer.

Ethics Committee Approval: The study had the approval of the Institutional Ethics Committee. Informed Consent: All participants provided informed consent.

Peer-review: Internally peer-reviewed.

Conflict of Interest: The authors declared no conflict of interest.

Financial Disclosure: The authors declare that they have no relevant financial.

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