



Measurement of D-Dimer Levels in Hyperthyroidism Patients

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Abstract

Background: Haemostatic abnormalities were associated with hyperthyroidism patients. This study aimed to assess the D-dimer levels which indicate the hypercoagulable state in Sudanese patients with hyperthyroidism. **Material and Methods:** A descriptive analytical case study was conducted in faculty of medical laboratory science, Alneelain University, Khartoum, Sudan. A total of 80 participants were selected for this study, 40 of them were patient known diagnosed by hyperthyroidism as a test group; 20 (50%) were female and 20 (50%) were male; their mean age 36.3 years. Other 40 participants were normal healthy individual as control group. The plasma D-dimer level was measured by using semi-automated coagulometer (MISPA-i2Reagent-SWITZERLAND). Data were analyzed by using statistical package for social sciences (SPSS) Version 20. **Results:** In this study, the plasma D-dimer level has statistically significantly higher in hyperthyroidism patient compared to normal healthy control group (mean \pm SD 0.5008 ± 0.239 vs. 0.5 ± 0.618 mg/dl with P value 0.00), respectively. **Conclusions:** The present study revealed that the D-dimer levels were statistically significant higher in hyperthyroid patients.

Keywords

Hyperthyroidism, Coagulation, D-Dimer, Sudan

Subject Areas: Hematology

1. Introduction

The thyroid gland is found in the neck, below the laryngeal prominence. This is formed by angle of the thyroid cartilage that surrounds the larynx. The thyroid gland controls how quickly the body uses energy, makes proteins, and controls the body's sensitivity to other hormones. It participates in these processes by producing thyroid hormones, the principal ones being triiodothyronine (T3) and thyroxine (T4). These hormones regulate the

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growth and rate of function of many other systems in the body. T3 and T4 are synthesized from iodine and tyrosine. The thyroid also produces calcitonin, which plays a role in calcium homeostasis [1]. Hormonal output from the thyroid is regulated by thyroid-stimulating hormone (TSH) produced by the anterior pituitary, which itself is regulated by thyrotropin-releasing hormone (TRH) produced by the hypothalamus. Any disturbances in thyroid hormones lead to these diseases: hypothyroidism, hyperthyroidism, thyroid nodule and thyroid neoplasm. Hypothyroidism happens when the thyroid gland does not produce enough thyroid hormone. The most common form of hypothyroidism is Hashimoto's thyroiditis [2] [3]. Hyperthyroidism develops when the thyroid gland becomes overactive and produces too much thyroid hormone it produces hormones called T3 and T4. They control the body's metabolism. This condition is most common caused by the development of Graves's disease, an auto immune in which anomalous antibodies stimulate the thyroid to secrete excessive quantities of thyroid hormone [4]. Thyroid disorders are common endocrine disorders encountered in the African continent. Environmental and nutritional factors are often implicated in the occurrence of some thyroid disorders that occur in this part of the world [5]. In the United States, hyperthyroidism affects about 1.2% of the population [6]. About half of these cases have obvious symptoms while the other half does not [7]. It occurs between two and ten times more often in women [8]. The disease is more common in those over the age of 60 years [8].

The presentation of thyrotoxicosis is variable among patients. Thyrotoxicosis leads to an apparent increase in sympathetic nervous system symptoms. Younger patients tend to exhibit symptoms of sympathetic activation, such as anxiety, hyperactivity, and tremor, while older patients have more cardiovascular symptoms, including dyspnea and atrial fibrillation with unexplained weight loss [9].

Several pathophysiological mechanisms have been suggested to underlie the relation between thyroid hormone excess and hemostasis. One of these mechanisms is the activation of the immune system in thyroid disease [10] [11]. Hyperthyroidism is associated with a hypercoagulable state [12] [13].

2. Material and Methods

A descriptive analytical case study was conducted in faculty of medical laboratory science, Alneelain University, Khartoum, Sudan. A total of 80 participants were selected for this study, 40 of them were patient known diagnosed by hyperthyroidism as a test group; 20 (50%) were female and 20 (50%) were male; their mean age 36.3 years. Other 40 participants were normal healthy individual as control group; their mean age and gender were matched with patients group. The ethical consent was taken from all subject enrolled in this study. Blood sample was collected from all participants by clean vein puncture. Nine volume of fresh blood will be collected in one volume in tube containing 200 μ l of 3.2% tri sodium citrate solution and platelet poor plasma was prepared by centrifuged at 3000 rpm for 15 minutes. The plasma D-dimer level was measured by using semi-automated coagulometer using (MISPA-i₂ Reagent-SWITZERLAND); this reagent is used for in vitro quantitative determination of fibrin degradation product D-dimer in human plasma by Nephelometric Immunoassay that utilizes antibody coated latex particles. In the presence of D-dimer, the particles aggregate and light scattering increases. The increase in scattering is proportional to the amount of D-dimer in sample, and in the procedure was carried out as per the manufacturer instructions.

None of the patients had a history of coagulopathy disease that could have disrupt the coagulation-fibrinolytic balance. This study was approved by scientific research committee, faculty of Medical laboratory sciences, Alneelain University. The informed consent was obtained from all participants in this study before the samples were collection. Data were analyzed by using statistical package for social sciences (SPSS) version 20.T. test was used for comparison between different study groups. The level of statistical significance was set at less than 0.05.

3. Result

This prospective case control study done in February 2016. A total of 80 subject were included in this study 40 were patients known diagnosed by hyperthyroidism as a test group 20 (50%) were female and 20 (50%) were male; their mean age 36.3 years. Others 40 subject were normal healthy individual as normal control group; their mean age and gender were similar with patients group.

The current study revealed that the D-dimer levels were statistically significantly higher in patients with hyperthyroidism compared with normal health control group, (The mean and SD 0.5008 ± 0.239 vs. 0.215 ± 0.618 mg/dlP value 0.00) respectively (**Table 1**).

Based on the gender and age this study found that there was no statistically significant different between age, gender and levels of D-dimer (P value 0.15 and 0.78) respectively.

Table 1. The association of D-dimer levels, TSH, T3 and T4 in patients with hyperthyroidism and normal control.

Case Parameters	Patient Mean \pm SD	Control Mean \pm SD	P Value
D-Dimer	0.5008 \pm 239	0.215 \pm 0.618	0.00
TSH	0.08 \pm 0.20	1.77 \pm 0.849	0.00
T3	305.6 \pm 127.5	149.25 \pm 30.34	0.00
T4	15.8 \pm 3.65	7.34 \pm 1.74	0.00

4. Discussion

This study aimed to assess the plasma D-dimer level which indicates the hypercoagulable state in the patient with hyper thyroidism. Many hypothesis suggest that a strong correlation between the elevation of thyroid hormone and abnormal homeostasis. D-dimer is a fragment of cross-linked fibrin and a good biochemical marker of thrombosis [14].

The current study revealed that the D-dimer level was statistically significantly higher in patients with hyperthyroidism compared with those normal healthy control groups (P value 0.00). This finding was in agreement with study done in 2001 by Chadevarian *et al.* who reported the D-dimer level was statistically significantly higher in patients with hyperthyroidism. The interesting result of this study was also in concordance with recent study published in 2011 cited by Debeij J., Suzanne C. C., van Zaane B. *et al.* who found the D-dimer levels was significantly higher in hyperthyroidism patients [15] [16].

The present study showed that a significant correlation between thyroid hormone T3, T4 and plasma D-dimer level with P value 0.00. This findings was agree with Erem *et al.* and study done by Burggraaf *et al.* who reported that the T3, T4 was associated with elevation plasma D-dimer level in hyperthyroid patients [17] [18]. Our findings was in contrast with studies cited by Chadevarian *et al.* [19], Debeij J., Suzanne C. C., van Zaane B. *et al.* [16] and Yango *et al.* [14]. This may be attributed to our patients were new cases in this study or might be due to ethnic background.

5. Conclusion

Sudanese patients with hyperthyroidism presented a state of hypercoagulability.

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